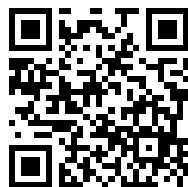

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**EASTERN ARCHIPELAGO
PILOT
VOL.III**

**INCLUDING THE
NORTH-EASTERN END OF CELEBES,
MOLUKKA, CERAM, BANDA AND
ARAFURA SEAS, AND THE WESTERN
END AND SOUTHERN COAST OF
NETHERLANDS NEW GUINEA.**

**FIFTH EDITION
1956**

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RAADPLEEG UITSLUITEND

verzamel
B. A. Z. aan binnenkant voorkaft,
eventueel ook voor supplement. ogle

KRACHT ZÜNDE BAZ'S BY VERSCHYNNEN SUPPL.
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A Supplement to this volume will generally be published annually until the latter is again taken up for revision.

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Geographical Dictionary, 1911

Eastern Archipelago

Pilot

VOLUME III

INCLUDING THE

NORTH-EASTERN END OF CELEBES,
MOLUKKA, CERAM, BANDA AND
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THE BEARINGS OF LIGHTS ARE GIVEN FROM SEAWARD.

THE LATITUDES AND LONGITUDES GIVEN IN THE TEXT ARE APPROXIMATE.

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WHEN SHADING IS USED TO INDICATE COLOURS OF FLAGS, TIDAL LIGHT SIGNALS, OR BEACONS, IT IS AS FOLLOWS:



Yellow.



Red.



Blue.



Green.



Black.

BIBLIOGRAPHY

The following works, other than British Government publications, have been consulted in the preparation of this edition :—

BRITISH :

Statesman's Year Book, 1955.

Whitaker's Almanack, 1955.

DUTCH :

Zeemansgids voor Nederlands Oost-Indië, Deel II, 1947, and
Aanvullingsblad No. 8, 1955.

Zeemansgids voor Nederlands Nieuw Guinee, 1951, and
Aanvullingsblad No. 3, 1955.

Bijlage Lighten Lijst en Betonningsstaat, 1955.

Zeemansgids voor Indonesië, Deel III, 1951 and

Aanvullingsblad No. 3, 1955.

Betonnings en Bebakeningstaat van Indonesië, 1955.

Bijlage No. 3 van het Bericht aan Zeevarenden, 1949.

Indonesia List of Lights, 1955.

CONTENTS

	PAGE
Caution	<i>facing</i> ii
Advertisement	iii
Bibliography	iv
Contents	v
List of Views	vi
Glossary	x
System of Orthography	xii
Information relating to Charts, Sailing ¹ Direction, and the General Navigation of H.M. Ships	xvi
Index Chart	<i>facing</i> 1

CHAPTER I

General remarks. — Trade. — Communications. — Radio stations. — Fuel. — Repairs. — Deratisation. — Standard and Summer times. — Pilotage. — Buoyage. — Signals. — Regulations. — Life-saving. — Submarine cables. — Oceanic banks. — Tidal streams. — Currents. — Climate and weather.	1-34
---	------

CHAPTER II

Islands between Mindanao and Celebes, North-eastern end of Celebes, and Noordelijke Molukken except Obi eilanden	35-104
---	--------

CHAPTER III

Ceram sea	105-155
---------------------	---------

CHAPTER IV

Banda and Arafura seas	156-211
----------------------------------	---------

CHAPTER V

Coast of New Guinea—Tandjoeng Sele to Kaap de Goede Hoop, and Tanjoeng Sele to Bensbach river.—Off- lying islands	212-278
---	---------

Appendix.—List of principal ports, showing ² particulars of depths, &c.	279
Index	281-309

LIST OF VIEWS

	<i>On or facing page</i>
Nanusa eilanden from south-westward	36
Talaud eilanden.—Karakelong from westward	36
View, in three parts, of southern part of Talaud eilanden from west-south-westward	37
Southern part of Talaud eilanden from south-westward	37
Marore from eastward	39
Kawio eilanden from east-south-eastward	40
Islands north-eastward of Sangi	40
Kawalusu, bearing 100°, 24 miles	40
Three views of Sangi eilanden from west-south-westward	41
Sangi eilanden.—Siau from west-north-westward	48
Sangi eilanden.—Siau and islands eastward from south-eastward	48
Sangi eilanden.—Biaro from north-eastward	48
Sangi eilanden.—Biaro from south-south-westward	48
Sangi eilanden.—Siau.—Gunung Api, bearing 018°, 48 miles	49
Sangi eilanden.—Tahulandang group from westward	49
Northern approach to Baai van Menado	49
North-eastern extremity of Celebes	55
Noord Loloda eilanden from west-south-westward	60
Noord Loloda eilanden from southward	60
View, in two parts, of northern part of Halmahera from westward	60
View, in two parts, of western side of Halmahera	61
West coast of Halmahera.—Mountains eastward of Tandjung Uwama from westward	61
Ternate, bearing 045°, 38 miles	67
Islands off the west coast of Halmahera	67
Moti and Makian from south-westward	67
Goraitji eilanden from the vicinity of Wolf rock	67
Three views of the approach to Ternate from southward	80
Djoronga and Damar from south-south-eastward	86
View, in two parts, of Morotai from south-westward	86
Bocht van Galela from north-eastward	86
View, in two parts, of mountains southward of Buli baai from vicinity of Togoplun	87
Gébé from west-north-westward	87
Weda baai.—Entrance to Baai van Kokka	97
Weda baai.—Widi eilanden	97
Weda baai.—Rede Mesa	98
Klaarbeek, bearing 248°, 13 miles	104
Kommerrust, bearing 203°, 3 miles	104
Straat Tjapalulu from northward	106
South-eastern extremity of Sanana, bearing 359°, 16 miles	112
Western part of Mangoli from west-north-westward	114
Eastern extremity of Lifumatola, bearing 180°, 28 miles	114
Obi eilanden from southward	114
Middle part of Kofiau from northward	115

	<i>On or facing page</i>
Western part of Misool from northward	115
East coast of Misool	115
Ef Kaja from east-north-eastward	115
Tobalai, bearing 214°, 24 miles	117
Lawin eilanden, bearing between 130° and 142°	118
Kekek, bearing 152°, 14 miles	118
Two views of Pisang	118
Kofiau.—Mata, bearing 248°	119
Approach to Baai van Namrole from southward	130
Ambelau, nearing 350°, 30 miles	132
South coast of Buru.—Approach to Tifu baai from southward	132
Manipa, bearing 337°, 28 miles	132
Boano, bearing 225°, 13 miles	132
View, in two parts, of Kelang and western end of Ceram from northward	133
Kelang, bearing 349°, 26 miles	133
Western part of north coast of Ceram from north-eastward	136
North coast of Ceram.—Approach to Sukaradja from northward	136
North coast of Ceram.—Tudjuh eilanden from west-north- westward	136
Eastern part of north coast of Ceram from north-westward	137
Ceram.—Mountains from northward	137
Eastern end of Ceram from east-north-eastward	137
Ceram.—Approach to Bula baai from north-eastward	137
Oson, bearing 328°, 26 miles	147
View, in two parts, of the south-eastern extremity of Ceram	148
Ambon, Haruku and Saparua, bearing 315°, about 40 miles	148
South-eastern side of Ambon from eastward	149
South-western side of Ambon from westward	149
Saparua, bearing 000°	149
Haruku from north-north-westward	153
Straat Saparua from north-westward	153
Baai van Nalahia from north-north-eastward	155
Suanggi, bearing 056°, 6 miles	158
Rozengain, bearing 000°, 7 miles	160
Banda eilanden from north-north-westward	162
Banda eilanden from south-westward	162
Banda eilanden.—Ai and Run, bearing 213°, 7 miles	162
Kai eilanden.—Southern extremity of Kaimeer, bearing 062°, 8 miles	163
Kai eilanden.—Northern end of Nuhu Tjut from westward	163
Gorong eilanden from west-south-westward	164
Watubela eilanden.—Northern extremity of Tioor, bearing 079°, 24 miles	164
Watubela eilanden.—Southern extremity of Baām, bearing 284°, 10½ miles	164
Watubela eilanden.—Northern extremity of Kasiui, bearing 203°, 7 miles	165
Watubela eilanden.—Northern extremity of Watubela, bearing 239°, 6 miles	165
Watubela eilanden from east-south-eastward	165
Kai eilanden.—Western extremity of Bui, bearing 191°, 8 miles	165
Kai eilanden.—Namsar, bearing 141°, 8 miles	165
Sermata eilanden.—Maopora peak, bearing 235°	192

	<i>On or facing page</i>
Sermata eilanden.—Teun, bearing 216°, 45 miles	193
Sermata eilanden.—Nila, bearing 199°, 25 miles	194
Serua, bearing 084°, 20 miles	195
Sermata eilanden.—Three views of Romang group	196
Sermata eilanden.—Damar from north-eastward	196
Sermata eilanden.—Kisar from southward	197
Sermata eilanden.—Lèti from northward	197
Northern end of Tanimbar eilanden from eastward	197
Tanimbar eilanden from north-westward	197
Tanimbar eilanden.—Mulu, bearing 328°, 15 miles	201
Tanimbar eilanden.—Maru, bearing 300°, 10 miles	202
Tanimbar eilanden.—Islands westward of Jamdena from north-westward	204
Tanimbar eilanden.—Approach to Straat Jamdena from south-westward	204
Tanimbar eilanden.—Islands westward of Jamdena	204
Tanimbar eilanden.—View, in two parts, of Straat Egeron from westward	205
Tanimbar eilanden.—View, in two parts, of Straat Egeron from north-eastward	205
Tanimbar eilanden.—View, in two parts, of Straat Egeron from south-eastward	208
Tanimbar eilanden.—Approach to Rede Ritabel from northward	208
Tanimbar eilanden.—Fordate summit, bearing 156°	208
Schildpad eiland, bearing 080°, 7 miles	208
Ajoe, bearing 045°, about 15 miles	213
Islands north-westward of Waigeo	214
Three views of north coast of Waigeo	214
Groot Fam, bearing 135°	215
View, in two parts, of Straat Dampier from eastward	215
View, in two parts, of north coast of Batanta	222
South coast of Waigeo.—Sonek Besar and Saonek Ketjil from southward	222
South coast of Waigeo.—Entrance to Majalibit baai from south-eastward	222
Western part of Batanta from southward	223
Approach to Straat Sagewin from vicinity of Doea eilanden	223
Approach to Straat Sagewin from southward	223
Gebroken eilanden from south-westward	223
Salawati.—Two peaks south-eastward of Wagom, bearing 072°, 17 miles	224
Kaboe eilanden from south-westward	232
North coast of New Guinea.—Tamrau gebergte from west-north-westward	232
North coast of New Guinea.—Mios Soe from south-south-eastward	232
North coast of New Guinea.—Two views of Kaap de Goede Hoop	233
Southern side of Mc Cluer golf from northward of Tandjoeng Fatagar	233
Southern side of Mc Cluer golf.—Four views of approach to Baai van Sekar	244
Approach to head of Golf van Bintoeni	245
Southern side of Gold van Bintoeni.—Approach to Sungei Kasoeri from northward	245

	<i>On or facing page</i>
Southern side of Golf van Bintoeni.—Approach to Sungei Kasira from northward	245
Southern side of Golf van Bintoeni.—Approach to Sungei Kaitero from west-north-westward	245
Pisang eilanden from east-south-eastward	252
West coast of New Guinea.—Approach to Mc Cluer golf from southward	252
West coast of New Guinea.—Approach to Fak Fak from westward	252
South-west coast of New Guinea.—Approach to Straat Nautilus from south-eastward	252
South-west coast of New Guinea.—Approach to Straat Nautilus from eastward	253
South-west coast of New Guinea.—Approach to Bitsjara baai from south-westward	253
South-west coast of New Guinea.—Approach to Triton baai from south-westward	253
South-west coast of New Guinea.—View, in two parts, of approach to Kajoe Merah baai from west-south-westward	253
South-west coast of New Guinea.—Poeloe Naurio, bearing 000°	266
South-west coast of New Guinea.—Approach to Otakwa rivier from south-westward	266
South-west coast of New Guinea.—View, in two parts, of approach to Bloemen rivier from south-westward	266
South-west coast of New Guinea.—Approach to Eilanden rivier from westward	267
South coast of New Guinea.—Tandjoeng Kaja Kaja, bearing 350°	267

GLOSSARIES

OF WORDS OCCASIONALLY FOUND ON THE CHARTS
AND IN SAILING DIRECTIONS

MALAY—ENGLISH

Malay	English	Malay	English
Aër, Air, Ajer .	Water, stream	Koeala, Kuala	
Alangan . . .	Bar	Koewala, Ku-	
Aroes, Arus . .	Current	wala . . .	Mouth of a river
Bahroe, Bahru .	New	Koelon, Kulon .	West, western
Bandar, Bendar .	Port, trading town	Kramat . . .	Holy place, shrine
Barat	West, western	Laboean, Labuan,	
Batang air . . .	River	Laboechan, Lab-	
Batoe, Batu . .	Stone, rock	uhan	Anchorage, har-
Bendar	Port trading town	Larangan . . .	bour
Besar	Large, great	Laoet, Laut . .	Prohibited
Beting	Shoal	Lebar	Sea, North
Betoeng, Betung	Large	Lor	Wide, broad
Boekit, Bukit .	Hill, height		North, northern
Boesoeng, Busung	Islet, large sand-	Mendara . . .	Minaret, watch-
	bank		tower
		Merah	Red
		Moeara, Muara,	
		Moeoro, Muoro	Mouth of a river
Dalam, Dalem .	Deep, depth, in-		
	side	Napoe, Napu . .	Reef
Danau, Dano . .	Lake	Noehoe, Nuhu,	
Darat	Land, the interior	Noesoe, Nusa .	Island
Djalan	Road, way, course		
Djambatan . . .	Bridge, gangway,	Oedjoeng, Udjung	Point
	jetty, mole	Oelak, Ulak . .	Eddy, whirlpool
Djernih	Clar, pure	Oetara, Utara . .	North, northern
		Paja	Marsh, swamp
Gat	Channel, passage	Pangkalan . . .	Landing place
		Pantjang	Pole, stake, pile
Geloeng, Gelung.	Channel over a	Parigi, Perigi .	Well, spring
	bar, or, in a	Pasanggrahan .	Government rest-
	river		house
Gili	Islet, rock	Pasi, Pasir . . .	Sand, sandbank
Goenoeng, Gun-		Pelabuan	Anchorage
ung	Mountain	Perhentian . . .	Rest-house
Goesoeng, Gusung	Shoal, reef islet,	Perigi, Parigi .	Well, spring
	summit, moun-	Pinggir laut . .	Coast, seaboard
	tain top	Pontjak	Summit, peak
		Praja	Town
Hitam, Itam . .	Black, dark	Praoe, Prau . . .	Boat, ship
		Poeloe, Pulu . .	Island
Idjau	Green	Poeloe Poeloe,	
		Pulu-pulu . . .	Group of islands
Kaler	North, northern	Poera, Pura, . .	
Kali	River	Poeri, Puri . . .	City, town
Kampoeng, Kam-		Poetih, Putih . .	White
pung	Village		
Karang	Coral, reef	Ras	Head
Kering	Dry	Rawa, Rawah .	Marshy ground
Ketjil,	Small, little	Rawang	Swamp; Gap
Kidoel, Kidul .	South, southern	Rendah	Low
Koeta, Kota, . .		Riam, Rijam . .	Waterfall, rapid
Koto, Kuta . .	Fortified town	Rimba, Rimbo .	Virgin jungle

MALAY—ENGLISH—*continued*

Malay	English	Malay	English
Roemah, Rumah	House	Teroesan, Terusan, Troesan, Trusan	Connecting channel
Sawang . . .	Narrows, strait	Timoer, Timor, Timur . . .	East, eastern
Selat . . .	Strait, channel, narrows	Tinggi . . .	High, height, lofty
Selatan . . .	South, southern	Tinjau . . .	Look-out
Soember, Sumber	Spring of water	Titian . . .	Mole, jetty, foot-bridge
Soemoer, Sumur	Well (water)	Tjadi . . .	Little, small
Soengai, Sungai	River	Tjandi . . .	Shrine, monument
Soengei, Sungei		Tjetek . . .	Shallow
		Tokong . . .	Rocky, treeless islet, large rock, shrine
Taka, Takat . .	Shoal, reef, rock	Troemboe, Trumbu	Reef which dries
Tandjoeng, Tandjung	Cape, headland, promontory	Toekeoh, Tukuh, Toekoh, Tukoh	Islet
Tasik . . .	Lake		
Telaga, Telago .	Pond, well	Wai, Waj . . .	Stream, creek
Teloek, Telok, Teluk . . .	Bay, bight	Wetan . . .	East, eastern
Tenang . . .	Calm, smooth		

Note.—The vowels OE in Indonesian names instead of the letter U will continue to appear on certain Admiralty charts pending revision.

DUTCH—ENGLISH

Dutch	English	Dutch	English
Archipel . . .	Archipelago	Noord . . .	North
Baai . . .	Bay	Ondiepte . . .	Shoal
Bank . . .	Bank, shoal	Oost . . .	East
Berg . . .	Mountain	Oud . . .	Old
Bocht . . .	Bight	Punt . . .	Point, corner
Boom . . .	Tree	Rede . . .	Roadstead
Bosch . . .	Forest, wood	Rif . . .	Reef
Droogte . . .	Shoal	Rivier . . .	River
Eiland . . .	Island	Rood . . .	Red
Eilandje . . .	Islet	Rots . . .	Rock, rocky islet
Gebergte . . .	Mountain range	Schiereiland . .	Peninsula
Geul . . .	Channel	Steen . . .	Small, rock, stone
Golf . . .	Gulf	Straat . . .	Strait
Groot, Groote .	Great, large	Vaarwater . . .	Channel, navigable water or fairway, passage
Heuvel . . .	Hill	Valsch . . .	False
Hoek . . .	Cape, point	Vlakte . . .	Plain
Hoofd . . .	Headland	Vulkaan . . .	Volcano
Hoog . . .	High	West . . .	West
Hout . . .	Wood	Wit . . .	White
Kaap . . .	Cape	Zand . . .	Sand
Klein, Kleine .	Little, small	Zandplaat . . .	Sandbank and cay
Klip . . .	Rock, crag, cliff	Zuid . . .	South
Kloof . . .	Cleft	Zwart . . .	Black
Kreek . . .	Creek		
Meer . . .	Lake		
Midden . . .	Middle		

Note.—*Dj* in Dutch is to be pronounced as *j*, *ij* as *ai*, *f* as *y*, *oe* as *u*, *sj* as *sh* and *tj* as *ch*.

SYSTEM OF ORTHOGRAPHY

The following rules for the spelling of geographical names (termed P.C.G.N. Principles) have been adopted for British official use, and the names in Admiralty Hydrographic publications will be rendered in accordance with these rules as opportunity occurs.

In new editions of the various volumes of sailing directions names are, generally speaking, given in accordance with these rules, but where the name on the chart shows an older rendering of a name, such chart name is given in brackets after the new rendering and will also be given in the Index.

The rules for spelling in the P.C.G.N. Principles are as follows :—

- (1) The spelling of the names of (a) regions and geographical features of continental or inter-national extension, (b) water-areas extending beyond the territorial limits of recognized government, and (c) countries, shall be in accordance with English conventional usage; *e.g.*, (a) Sahara, Alps, Danube, (b) Bay of Biscay, (c) Italy.
- (2) In the case of oceanographical features lying outside territorial waters, the descriptive terms entering into their names shall be in English; *e.g.*, Challenger Bank, Dogger Bank, Walfisch Ridge (*not* Walfisch Rücken).
- (3) The approved name of any administrative division of a state,* or federation of states, or of any natural or artificial geographical feature or of any place lying wholly within one state, or federation of states, shall be that adopted by the supreme administering authority concerned with that state or federation of states; *e.g.*, Uttar Pradesh (*not* United Provinces), Kaliningrad (*not* Königsberg) :

but, should a different name be current in English conventional usage, the latter may be given subordinate recognition; *e.g.*, Cabo de Hornos (Cape Horn), Dhiórix Korínthou (Corinth Canal), Moskva (Moscow).
- (4) Where any names of the kinds referred to in Section (3) above contains a descriptive term in a foreign language that term shall not be translated into English; *e.g.*, Cabo de Hornos (*not* Cape de Hornos), Schloss Bellinghoven (*not* Bellinghoven Castle), Isola d'Ischia (*not* Island of Ischia) :

but, where a geographical term on a foreign map or chart stands

* For the purpose of applying these Principles, the term "state" shall be taken to include an independent country, or colonial territory, or protectorate, protected state, or trust territory.

in isolation and is neither a geographical proper name nor is attached to such a name, it may be translated ; *e.g.*, " bridge " (*not* German " Brücke "), " ford " (*not* Russian " brod ").

- (5) The names of places and of geographical features in countries which officially use varieties of the Roman alphabet shall be accepted in their official spelling, including the accents and diacritical marks used in the respective alphabets.
- (6) The non-Roman letters in the official names of places and geographical features in countries which use partly-Roman alphabets may be transliterated into Roman letters in accordance with the conventions of the respective partly-Roman alphabets.
- (7) In countries where the official alphabet of the administering authority is not Roman :
 - (a) where an official Romanization acceptable to the Committee* is in current use the spelling of names shall be in accordance with it.
 - (b) where no official national Romanization exists but a system of Roman transliteration has been accepted by the Committee* for the country under consideration, the official forms of names shall be transliterated in accordance with it.
 - (c) where there is no system of Romanization, or none acceptable to the Committee,* the official forms of names shall be transliterated into the conventional alphabet given below.
- (8) In countries where the official script is not alphabetical the official forms of names shall be rendered in Roman letters in accordance with systems of transcription approved by the Committee,* *e.g.*,
China : the Wade-Giles system as modified in 1942
Japan : the Hepburn system as recommended in 1942
Korea : the McCune-Reischauer system.
- (9) In those territories where the foregoing Principles may prove to be inapplicable, geographical names should, whenever possible, be recorded in the alphabets officially used for the languages concerned, or be collected in the field by the scientific methods employed for the phonetic recording of speech. Only when these means fail should they be recorded in the conventional alphabet given below.

This system aims at giving a close approximation to the *local* pronunciation ; but it is recognised that in some languages, notably Russian, Greek, and Arabic, the necessity for letter-for-letter transliteration often renders this impossible.

* Permanent Committee of Geographical Names.

CONVENTIONAL ALPHABET

Symbol

Range of sound represented

Vowels

a	<i>a</i> in <i>father</i> ; all the sounds represented by <i>a</i> in the French words <i>pâte, pas, page, pâle</i> ; <i>o</i> in English <i>son</i> or <i>u</i> in <i>cut</i> ; also a shade of the unstressed neutral vowel (see under <i>ø</i> below).
e	the first part of the diphthong in <i>day</i> , <i>e</i> in French <i>thé</i> ; <i>ai</i> in <i>fair</i> , <i>è</i> in French <i>père</i> ; <i>e</i> in <i>bet</i> ; a shade of the unstressed neutral vowel (see under <i>ø</i> below).
i	<i>ee</i> in <i>fee</i> , <i>i</i> in French <i>si</i> ; <i>i</i> in Italian <i>via</i> ; <i>i</i> in <i>sit</i> .
o	<i>ou</i> in <i>bought</i> , <i>aw</i> in <i>law</i> , <i>o</i> in <i>not</i> ; <i>eau</i> in French <i>beau</i> , <i>o</i> in <i>rotund</i> .
ø	<i>ö</i> in German <i>schön</i> , <i>eu</i> in French <i>peu</i> ; <i>eu</i> in French <i>peur</i> , <i>ø</i> in French <i>œuf</i> ; <i>ea</i> in <i>earth</i> (the last is the stressed neutral vowel in English). The unstressed neutral vowel (the sound of <i>a</i> in <i>marine</i> , <i>e</i> in <i>often</i> , <i>u</i> in <i>difficult</i>) is better represented, according to its nearest approximation, by <i>a</i> or <i>e</i> .
u	<i>oo</i> in <i>boot</i> ; <i>oo</i> in <i>foot</i> or <i>u</i> in <i>put</i> (but not in <i>but</i>).
ü	<i>ü</i> in German <i>über</i> , <i>u</i> in French <i>lune</i> .
y	the cavernous vowel, unknown in standard English, represented by <i>bl</i> in Russian and by <i>s</i> in Turkish. Note that <i>y</i> is also used for a consonant-symbol (see below).

Diphthongs

Diphthongs may be represented by combinations of the vowel-symbols given above.

Consonants

b	English <i>b</i> , any other sound recognized as a kind of <i>b</i> by English ears, as <i>b</i> in Spanish <i>saber</i> .
ch or c* (-tah)	<i>ch</i> in <i>church</i> . <i>c</i> is established with this value in parts of Africa. * See Instruction 8, below
d	any sound recognized as a kind of <i>d</i> .
dh	the soft sound of English <i>th</i> in <i>this, they</i> , etc.
f	any kind of <i>f</i> .
g	<i>g</i> in <i>got</i> or <i>gift</i> .
gh	the soft guttural sound represented by <i>ġ</i> (<i>ghain</i>) in Arabic, which resembles that of Parisian <i>r</i> .
h	(i) the aspiration of vowels (the sounds preceding the vowels in <i>her hat</i>). (ii) the aspiration of consonants (emphatic <i>h, t</i> and <i>p</i> are aspirated in English ; <i>b</i> is often aspirated in Irish English). In a conventional alphabet it is possible to distinguish between the digraphs (pairs of letters standing for single sounds) <i>dh, gh, hh, sh, th</i> and <i>zh</i> , and aspirated <i>d, g, h, s, t</i> and <i>z</i> , respectively, only by means of elaborate devices.
j (-dzh)	in <i>jib</i> or <i>g</i> in <i>gem</i> .
k	any kind of <i>k</i> -sound, as <i>c</i> in <i>cat</i> .
kh	<i>ch</i> in Scottish <i>loch</i> or German <i>ach</i> .
l	<i>l</i> in <i>leave</i> ; <i>ll</i> in <i>wall</i> ; <i>ll</i> in Welsh <i>llan</i> .
m	English <i>m</i> .
n	English <i>n</i> .
ñ or ny	as in Spanish <i>cañón</i> . Established in many parts of Africa.
ng	<i>ng</i> in <i>singer</i> ; <i>ng</i> in <i>finger</i> .
p	any kind of <i>p</i>
q	the guttural sound represented by <i>ق</i> (<i>qaf</i>) in Arabic.
r	<i>r</i> as sounded in Scotland ; any other clearly rolled or trilled <i>r</i> -sound, like <i>r</i> in Spanish <i>pero</i> .

Symbol

Range of sound represented

Consonants

s	ss in <i>hiss</i> (but not <i>s</i> in <i>his</i>).
sh or s*	sh in <i>fish</i> . * See Instruction 6, below.
t	any kind of <i>t</i> .
th	hard English <i>th</i> as in <i>thistle</i> .
v	English <i>v</i> .
w	English <i>w</i> .
x (-ks)	<i>x</i> in <i>extra</i> (not <i>x</i> in <i>exact</i>).
y	<i>y</i> in <i>yet</i> . Note that <i>y</i> is also used as a vowel-symbol (see above).
z	English <i>z</i> or the <i>s</i> in <i>was</i> .
zh (or ž)* (')	<i>ž</i> in French <i>je</i> ; <i>s</i> in <i>measure</i> . (inverted comma) The Semetic sound represented by <i>ع</i> (' <i>ain</i> ') in Arabic ; the glottal stop. (In practice the two will not conflict.) * See Instruction 6, below.

Instructions for spelling in the conventional alphabet

1. Standard native pronunciation is to be taken as the basis for spelling.
2. Each sound is to be represented by its closest corresponding symbol, and a symbol may be doubled only to indicate a clear repetition of the same sound.
3. If their representation be indispensable, a vowel-symbol may be marked with :
 - (a) an acute accent (') for *stress* (*Kórinthos*—Greece)
 - (b) a macrom (¯) for *length* (*Tōkyō*—Japan)
 - (c) a tilde (~) for *nasalization* (*Eggā*—Nigeria, *unofficial*).
4. Retroflex, emphatic, implosive or ejective consonants may be indicated by dots beneath the symbols representing them.
5. Palatalization of consonants as in Russian may be indicated by an apostrophe (') after the symbol affected.
6. If it be imperative to distinguish between *sh* and *ʃ* (the symbols given above) and aspirated *s* and *ʃ* respectively, the alternative symbols *ś* and *ʃ̣* may be used for the former pair. Similarly, *c* and *ch* could stand for the unaspirated and aspirated " *ch* " sounds respectively.
7. In the narrow rendering of names in, and their close transliteration into, the conventional alphabet, recommended for textual documents and particularly for gazetteers, the diacritical marks listed in 3, 4, 5 and 6 above, should be used. From the broad rendering in, and broad transliteration into the conventional alphabet, appropriate to maps and charts, these marks may be omitted. (This instruction applies only to the conventional alphabet and has no bearing whatever on No. 5 of the Principles of Nomenclature).

Alphabetical order

The full conventional alphabet consists of the following thirty-seven symbols :

a, b, ch or c, d, dh, e, f, g, gh, h, i, j, k, kh, l, m, n, ñ or ny, ng, o, ô, p, q, r, s, sh or ś, t, th, u, û, v, w, Z, y, z, zh, or ž, (')

but names written in it should be filed or arranged in common English alphabetical order disregarding (').

LAWS AND REGULATIONS APPERTAINING TO NAVIGATION.

While, in the interests of the safety of shipping, the Admiralty make every endeavour to include in their hydrographic publications details of the laws and regulations of all countries appertaining to navigation, it must be clearly understood:—

- (a) *that no liability whatever can be accepted for failure to publish details of any particular law or regulation, and*
- (b) *that publication of the details of a law or regulation is solely for the safety and convenience of shipping and implies no recognition of the international validity of the law or regulation.*

INFORMATION RELATING TO ADMIRALTY CHARTS AND PUBLICATIONS, GENERAL NAVIGATION, AND GENERAL METEOROLOGY.

ON THE CORRECTION OF ADMIRALTY CHARTS.

Guides to Navigation.—In addition to the charts, the navigational publications which are primarily affected by the continual changes and alterations that take place are the Admiralty Sailing Directions, the Admiralty List of Lights, Fog Signals and Visual Time Signals, and the Admiralty List of Radio Signals. The Admiralty Notices to Mariners contain information mainly for the correction of the charts and navigational publications.

CHARTS.

- 10 **1. Degree of Reliance.**—It should be clearly understood that the value of a chart depends on the character of the original survey and on the completeness of the reports of subsequent changes. The remarks on "The Use of Charts as Navigational Aids, &c." which are subjoined should be carefully studied in this connection.
- 15 **2. System of Dating and Issue of Corrected Copies.**—Admiralty charts after first publication are kept corrected by means of new editions, large corrections, and small corrections. Copies of charts issued by the Hydrographic Supplies Establishment, Admiralty Chart Agents or Admiralty Chart Depôts are corrected,
- 20 except from temporary and preliminary Notices to Mariners, for all navigational information to the date of issue.

New Charts.—The date of publication of a chart is shown outside the bottom margin, in the middle, e.g.:—

Published at the Admiralty 30th May, 1947.

- 25 *New Editions.*—When a chart is revised throughout and modernised in style a new edition is published, the date being shown outside the bottom margin and to the right of the date of publication, e.g.:—

New Edition 2nd Jany., 1947.

- 30 All large and small corrections notations are at the same time erased, and all old copies of the charts are cancelled.

Large Corrections.—When a chart is corrected from important information which is too comprehensive to promulgate by Admiralty Notice to Mariners or to insert conveniently by hand on existing

copies, but when the chart is not revised throughout, the date on which these corrections are made is shown on the chart outside the bottom margin and to the right of the date of publication, and in the case of a chart already marked with a new edition date, below such date, e.g.:—

5

Large corrections 10th Feb., 1947.

All small corrections notations are at the same time erased, and all copies of the chart are cancelled.

Small corrections.—

- (i) When a chart is corrected from the information promulgated 10 in an Admiralty Notice to Mariners (except temporary and preliminary Notices), the year, if not already shown, and number of the notice are entered in the bottom left-hand corner of the chart, e.g.:—

Small corrections 1947–903.

15

Copies of the chart stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents and the Admiralty Chart Depôts are corrected by hand from such information.

- (ii) Prior to 1954, when a chart was corrected from information 20 which was considered of no importance from the standpoint of safe navigation, and which was, therefore, not promulgated in an Admiralty Notice to Mariners, the year, if not already shown, and date of the correction were entered on the chart, in one of two ways, in the bottom 25 left-hand corner below the margin and in sequence, with the notations referred to in the preceding paragraph, e.g.:—

Small corrections, 1947—5.20—

or Small corrections 1947—(VI.25)

30

These indicated that the chart plate received minor corrections on the 20th May or 25th June, respectively, which would appear on later printings.

In such cases copies of the chart held by ships and establishments were not usually replaced by new copies, 35 but in exceptional cases, e.g., when new compasses were inserted, new copies of the charts might be supplied. It should, however, be particularly noted that the absence of corrections represented by square or bracket dates from a chart did not invalidate it for navigation. 40

- (iii) Since 1954, in order that more attention may be given to New Editions, Large Corrections and corrections by Notices to Mariners, and for other reasons, the making of minor corrections to Chart plates as in (ii) has been discontinued. 45 Information of no importance to safe and convenient navigation is instead recorded for inclusion in the next New Edition or Large Correction; or, for promulgation, in a later Notice to Mariners should a change of circumstance alter the importance of the information.

In consequence, the small correction date enclosed in 50 a rectangle does not appear later than 1953 on navigational charts. The date within brackets may still appear and is then an indication that magnetic compasses have been corrected for a change in variation.

3. Correction of Charts in Ships.—All small but important corrections affecting navigation that can be made to the charts by hand are promulgated in Admiralty Notices to Mariners and, with the exception of corrections from temporary or preliminary Notices, **6** should at once be neatly made in waterproof violet ink on the charts affected, the year (if not already shown) and numbers of the notices being inserted, also in waterproof violet ink, in the bottom left-hand corner of the chart. The recognised abbreviations shown on Admiralty chart No. 5011 ("Signs and abbreviations used on **10** Admiralty Charts") should be used.

Generally speaking, the amount of information which should be inserted on a chart should be in accordance with that already shown.

On large scale charts, the abridged descriptions, as shown on chart No. 5011, of all details of all lights, light-buoys and fog signals, and **15** the year dates of obstructions, reported shoals, dredged channels, depth on bars or in shifting channels, and irregularities of lights, should be inserted.

On coastal charts, the abridged descriptions of only the principal lights and fog-signals, i.e., those to assist in approaching or making **20** the land, should be inserted.

Particulars of such lights should be omitted, in the following order, as the scale of the chart decreases, viz.:—

- (i) Elevation, (ii) Period, (iii) Number in Group, and (iv) Visibility.

25 Particulars of fog signals should be inserted in their appropriate positions if space permits, but should otherwise be entered in a tabulated list under the title or some other convenient place on the chart.

Inner harbour light-buoys and beacons should not be inserted on coastal charts, and against other light-buoys only the character of **30** the light should be inserted.

On ocean charts, lights which are visible 15 miles or over should alone be inserted and then only their character and colour.

On all charts, writing should be inserted as much as possible clear of the water, unless the relative objects are on the water, and care **35** should be taken not to obliterate any information already on the chart. When cautionary or tidal notes, &c., are inserted, they should be written in a convenient but *conspicuous* place, preferably near the title, where they will not interfere with other details.

Erasures should never be made but the details should, when **40** necessary, be crossed through in waterproof violet ink.

Admiralty Notices to Mariners are occasionally accompanied by reproductions of portions of charts (known as "blocks"), and when correcting charts from such blocks the following points should be borne in mind:—

- 45** (i) A block may not only indicate the insertion of new information, *but also the omission of matter previously shown*. The latter would, however, invariably be mentioned in the text of the Notice, and the fact that a block accompanies a Notice should not cause the text of the Notice **50** to be disregarded.
- (ii) The limiting lines of a block are determined for convenience of reproduction and need not be adhered to when cutting out for pasting on the chart, provided that the point mentioned in the preceding paragraph is taken **55** into consideration.

- (iii) The new information shown on a block can sometimes be inserted on the chart by hand, the reason for issuing a block in such a case being to avoid a long description of the new information in the text of the Notice.
- (iv) Owing to distortion the blocks do not always fit the charts exactly, care should therefore be taken when pasting a block on to a chart that the more important navigational corrections fit as closely as possible. This can best be assured by fitting the block while it is dry and making two or three pencil ticks round the edges for use as fitting marks after the paste is applied.

Corrections from Temporary or Preliminary Notices to Mariners should be inserted on the charts *in pencil* and the year and number of the notice should be shown against them, e.g.:—N.M. 625/1947 temp., and also in the bottom left-hand corner of the chart, in pencil, below the small corrections notations (*see above*). Temporary corrections should be rubbed out when the notice is received cancelling them, but preliminary corrections should be inked in when the notice is received reporting that the changes have been made.

Charts stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents and the Admiralty Chart Depôts are not corrected from Temporary or Preliminary Notices to Mariners, and when charts are received from one of these sources they should be corrected in pencil as necessary from the copies of such Notices already held, or from those supplied with the charts.

Corrections from Radio Navigational Warnings concerning derelicts and drifting obstructions, the temporary extinction of lights, displacement of important aids to navigation, ice reports, &c., should also be noted *in pencil*, as received, on the charts affected. Radio Navigational Warnings of a permanent nature and those relating to derelicts and drifting obstructions dangerous to navigation are re-issued in the form of Admiralty Notices to Mariners, but other warnings are not re-issued in this way, except in special circumstances.

Corrections from information received from authorities other than the Admiralty should be noted, *in pencil*, on the charts affected, but no charted danger is to be expunged without the authority of the Hydrographer of the Navy.

NAVIGATIONAL PUBLICATIONS.

1. Admiralty Sailing Directions, Supplements, &c.—The Admiralty Sailing Directions, consisting of about 74 volumes for the whole world, contain general information useful to the navigator.

An index chart bound near the beginning of each volume shows the area dealt with and the serial numbers and limits of all Admiralty charts for the area which were published *when the volume was printed*.

Each volume is periodically revised throughout, and, in the intervals between the publication of new editions, Admiralty Notices to Mariners and Supplements are published to enable the volume to be corrected. It should, however be clearly understood that Sailing Directions cannot be correct in all minor details after the date of the latest Supplement.

The above-mentioned corrections are not made in the Sailing Directions stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts.

A new edition of each volume of Sailing Directions is published at intervals of approximately from ten to twelve years. The number

of the latest Admiralty Notice to Mariners used in its compilation is given in the "Advertisement" on page iii of each volume, and the numbers of the Notices affecting it between the dates of going to press and issue to ships and establishments are given in the Notice
5 announcing its publication, to enable the new edition to be corrected before being brought into use.

A Supplement to each volume is generally published annually, each succeeding Supplement cancelling the former. When a volume is taken up for revision, however, no further Supplement to that edition
10 is issued, but subsequent Notices to Mariners affecting it are summarised each year and issued as a separate publication, until the new edition of the volume is published.

A tabular form for notation of the existence of Supplements and Summaries of Notices is printed on the front fly-leaf of all Sailing
15 Directions, and these notations are made as necessary in all copies issued by the Hydrographic Supplies Establishment and the Admiralty Chart Depôts.

Supplements and Summaries of Admiralty Notices to Mariners should be retained intact. *Whenever reference is made to the Sailing
20 Directions, the Supplement, and where applicable the Summary, must be consulted.* The existence of a Supplement or Summary of Admiralty Notices to Mariners is to be entered in the tabular form inside the cover of the Sailing Directions. New and amended information appearing in the Supplements for the first time is indicated by square
25 brackets, and deletions from the previous Supplement are indicated by horizontal lines.

Admiralty Notices to Mariners affecting Sailing Directions *are not* to be cut up and pasted in, but the book is to be annotated in the margin, or corrected in manuscript, as convenient.

30 2. The Admiralty List of Lights, Fog Signals and Visual Time Signals.—The Admiralty List of Lights, Fog Signals and Visual Time Signals for the world is issued in twelve volumes divided geographically as shown on the index chart at the beginning of each volume.

35 Light-buoys are *not* included in the list.

The volumes are published annually at the rate of one volume per month; however, if there are insufficient corrections to justify the publication of a new edition of any volume, this will be notified by Notice to Mariners.

40 Each volume will be issued with an inscription on its cover and title page stating the date to which the volume has been corrected, which will be approximately eight weeks prior to the date of its issue. Corrections or additions to each volume, which may occur between the date of correction and date of issue, will be promulgated by Section III
45 of the Weekly Edition of Admiralty Notices to Mariners announcing the Publication of the new volume.

Amendments.—Important amendments are promulgated in Admiralty Notices to Mariners. In Section III of each Weekly Complete Edition of these Notices will be found additions and alterations made
50 to Lights, Fog Signals and Visual Time Signals by the Notices issued during the week affected; this section also includes other amendments, particularly amendments of a Temporary nature, which have not yet or will not necessitate the issue of a Notice to Mariners.

Corrections to the Light Lists may be extracted from Section III
55 and pasted in the appropriate volume.

Note.—Corrections are not made in copies of the Lists of Lights, &c.,

stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts, and copies received from these sources should accordingly be corrected from the weekly editions of the Notices to Mariners before being brought into use.

3. The Admiralty Lists of Radio Signals.—The Admiralty List of Radio Signals is issued as follows:—

Volume I.—Communications—Comprises particulars of radio-telegraph coast stations, together with general regulations; it also includes such subsidiary services as medical advice supplied by radio, distress signals and details of Air-sea Rescue Organisation. 5 10

Volume II.—Navigational Aids—Comprises particulars of services from direction-finding stations and radiobeacons including air radio-beacons useful to ships; also stations giving QTG service and calibration stations; all relevant codes and regulations will be found in this volume. 15

Volume III.—Meteorological Services—Comprises particulars of weather services provided for the use of shipping, together with relevant codes.

Volume IV.—Meteorological Observation Stations.

Volume V.—Comprises particulars of Radio time signals, Uniform time system, navigational warnings and Position fixing systems (Decca, Loran, Consol, etc.). 20

New editions of each volume will normally be published annually.

All corrections subsequent to the date of publication are promulgated in Section VI of the complete weekly edition of Admiralty Notices to Mariners. 25

Copies of the List stocked by the Hydrographic Supplies Establishment, Admiralty Chart Agents or the Admiralty Chart Depôts are not kept corrected, and Lists received from these sources should accordingly be corrected from the weekly editions of the Admiralty Notices to Mariners before being brought into use. 30

4. The Admiralty Tide Tables.—The Admiralty Tide Tables are published in three sections as follows:—

For "EUROPEAN WATERS," (including Mediterranean Sea)." 35

For "ATLANTIC AND INDIAN OCEANS"

For "PACIFIC OCEAN AND ADJACENT SEAS."

Each section contains two parts, Part I giving tidal predictions for Standard Ports and tidal stream predictions for certain straits and channels. Part II giving data for predicting tides at places which are not Standard Ports. 40

Admiralty Tide Tables, Part III, contains instructions for predicting tides and tidal streams, and for analysing observations of tides and tidal streams, with tables to assist prediction and analysis.

THE USE OF CHARTS AS NAVIGATIONAL AIDS AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION. 45

(1) Reliance on a chart.—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger the scale of the chart. 50

To estimate this the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circum-

stances that precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

- 10 It appears to be insufficiently realised that the degree of reliance which may reasonably be placed upon an Admiralty chart, even in surveys of modern date, is mainly dependent on the scale on which the survey was made. The scale for publication is now generally that of the original survey, except in the case of coast sheets which are sometimes reduced. It should not, therefore, be assumed that the original survey was made on a larger scale than that published.

It must be borne in mind that the principal method of ascertaining the inequality of the bottom of the sea is by the laborious process of sounding, and that in sounding over any area, the boat or vessel obtaining the soundings is kept on given lines; that each time the lead descends, or a sonic sounding is taken, the depth over only a small area is obtained, in the case of the lead, it has a diameter of only a few inches, and that consequently each line of soundings, though miles in length, is only to be considered as representing a narrow width.

Surveys are not made on uniform scales, but each survey is made on a scale commensurate with its apparent importance. For instance, a general survey of a coast which vessels only pass in proceeding from one place to another is not usually made on a scale larger than one inch to the nautical mile, while surveys of areas where vessels are likely to anchor are made on a scale of three inches to the mile, and surveys of frequented ports or harbours likely to be used by fleets, on a scale of from six inches to ten inches to the nautical mile.

Close examination by sounding is the only method by which surveys on a large scale can be made, and in view of the vast mileage of surveys yet requiring completion in the interests of navigation, it would be a waste of time to undertake large scale coast surveys.

The scale on which a survey is to be conducted having been settled, it is manifestly superfluous to obtain more lines of soundings than can be represented on the paper. 100 soundings, which is the maximum number that can be placed with clearness on every square inch of paper, means that on a scale of one inch to the mile each sounding on the chart occupies an area representing eight acres of actual ground, whilst on a scale of six inches to the mile each sounding represents an area of a little less than a quarter of an acre, i.e., of 100 feet square.

The following diagram represents as many soundings as can be placed legibly on a square inch of paper:—

16	15	15	13	13	14	12	11	10	9
14	15	14	14	13	13	12	11	9	8
15	15	14	17	16	14	13	10	10	9
16	16	17	18	16	12	11	8	9	10
18	17	15	12	9	7	7	7	9	10
19	16	12	9	5	4	5	6	8	9
22	19	16	10	3	5	6	7	8	10
20	16	12	7	5	6	6	7	8	10
18	15	11	9	7	7	7	8	10	11
20	17	14	11	12	10	9	10	11	13

Little assistance in detecting excrescences on the bottom is afforded by the eye, when sounding in a boat, even in clear water, on account of the observer being within five feet of the surface; none in turbid seas. If, therefore, there is no inequality in the soundings to cause suspicion, a shoal patch between two lines may escape detection. 5

Thus, in a chart on a scale of one inch to the mile, an inequality of some acres in extent rising close to the surface, if it happened to be situated between two lines, might escape detection; whilst in a chart on a scale of 6 inches, inequalities as large as battleships, if lying parallel with, and between the lines of soundings, might exist 10 without detection if they rose abruptly from an otherwise even bottom.

General coast charts should not, therefore, be looked upon as infallible, and a rocky shore should on no account be approached within the ten-fathom contour line, without taking every precaution to avoid a possible danger; and even with surveys of harbours 15 on a scale of 6 inches to the mile vessels should avoid, if possible, passing over charted inequalities in the ground, as some isolated rocks are so sharp that the lead may not find the highest part. Better results can, however, be obtained by sonic sounding owing to the rapidity with which such soundings can be taken, but even 20 this method will not find rocks unless the boat or vessel be directly over them.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water 25 is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion.

Soundings in hair line, which are shown on the latest charts in upright figures, and on other charts in sloping figures, indicate that 30 such soundings have been taken from smaller charts, an unreliable source, or adapted from old and imperfect surveys.

(2) **Fathom lines a caution.**—Except in plans of harbours that have been surveyed in detail, the six-fathom line on most Admiralty charts is to be considered as a caution or danger line against unneces- 35 sarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time 40 required for such a detailed survey. It is not contemplated that ships will approach the shore in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, as before mentioned, another warning, especially for ships of deep draught. 45

Charts on which no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surroundings depths, should always 50 be avoided as there is no knowing how closely the spot may have been examined.

(3) **Chart on largest scale always to be used.**—It sometimes happens that from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive 55 re-arrangement of coastline or sounding. This is an additional reason,

besides the obvious one of the greater detail shown, why this largest scale chart should always be used for navigating.

(4) **Caution in using small-scale charts.**—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile.

For the same reason bearings to near objects should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

(5) **Graduation.**—All plans are now being graduated in skeleton style before publication in order to facilitate easy reference to geographical positions; previously published plans are also graduated as opportunity offers. The graduation is, however, of necessity often based upon imperfect information of a conflicting nature; for this reason, whenever a geographical position is quoted other than approximate (i.e., when seconds are given), it is necessary to quote also the number of the particular chart from which the position has been derived.

In this connection it is pointed out that, whenever possible, a position should be transferred from one chart to another by bearing and distance from a distinguishing feature common to both, such as a point of land or a light, &c., and not by the graduation which may differ owing to one of the charts being constructed on later and more complete geographical data than the other.

(6) **Distortion of printed charts.**—The paper on which charts are printed is, from various causes, subject to distortion, but the effect of this is seldom sufficient to affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted upon the chart, especially if the lines are to objects at some distance. The larger the chart the greater the amount of this distortion.

(7) **Buoys.**—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should, therefore, be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings of fixed objects on shore or angles between them, and not by buoys.

(8) **Light-buoys.**—The lights shown by light-buoys cannot be implicitly relied on, as, if occulting or flashing, the apparatus may get out of order, or the light may be altogether extinguished. These lights in the British isles are from 5 to 217 candle-power.

(9) **Cable-buoys.**—Cable-buoys marking the ends of submarine cables usually are spherical or can-shaped, surmounted by a globe and occasionally a flag. Below the topmark two *white fixed* lights, disposed horizontally, may be exhibited, but they cannot be implicitly relied on.

(10) **Lights.**—Arcs drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely to indicate, in the case of lights which do not show the same characteristics or colours in all directions, the bearings between which the differences occur.

All the distances given in the Admiralty List of Lights and on the charts for the visibility of lights are calculated for a height of an

observer's eye of 15 feet. The table of distances visible due to elevation, at the beginning of each volume of the Admiralty List of Lights, affords a means of ascertaining how much more or less the light is visible should the height of the eye be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays 5 of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a 10 star immediately over the light a very correct bearing may be afterwards obtained from the compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen. 15

The power of a light can be estimated by remarking its candle power, as given in the Admiralty List of Lights, and in some cases by noting how much its visibility in clear weather falls short of the range due to the elevation at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear 20 weather, is manifestly of little brilliancy, as its elevation would permit it to be seen over 20 miles, if of any power. (See table in the Admiralty List of Lights.)

The distance from a light cannot be estimated either by its brilliancy or its dimness. 25

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip it may be determined whether the vessel is in the circle of visibility corresponding with the usual height of the eye or unexpectedly nearer the light.

(11) **Fog signals.**—Sound is conveyed in a very capricious way 30 through the atmosphere. The following points in regard to fog signals should be borne in mind:—

- (a) Fog signals are heard at greatly varying distances.
- (b) Under certain conditions of atmosphere, when an air fog signal is a combination of high and low tones one of the notes may 35 be inaudible.
- (c) There are occasionally areas around a fog signal in which it is wholly inaudible.
- (d) A fog may exist a short distance from a station and not be observable from it, so that the signal may not be sounded. 40
- (e) Some fog signals cannot be started at a moment's notice after signs of fog have been observed.

Mariners are therefore warned that fog signals cannot be implicitly relied upon, and that *the practice of sounding should never be neglected*. Particular attention should be given to placing "Look-out men" 45 in positions in which the noises in the ship are least likely to interfere with the hearing of the sound of an air fog signal; as experience shows that, though such a signal may not be heard from the deck or bridge when the engines are moving, it may be heard when the ship is stopped, or from a quiet position. It may sometimes be heard from aloft 50 though not on deck.

Great assistance may be obtained from radio beacons at many important lighthouses and light-vessels, but the attention of Mariners is called to the serious dangers which may arise from their misuse. No attempt should be made to approach such a position on a radio 55 bearing, whilst relying on hearing the sound fog signal in sufficient

time to alter course to avoid danger. When the radio fog signal is transmitted from a light-vessel, it is essential in order to avoid collision, that the bearing from the light-vessel should not be kept constant.

(12) **Tides.**—In navigating coastal waters where the range of the tide is considerable, caution is always necessary. The tidal predictions for Standard ports in the Admiralty Tide Tables can generally be relied upon to give the times of high and low water to within a few minutes, and heights within a few tenths of a foot. Larger errors are to be expected in the predictions for places which are not Standard ports, computed from the data in Part II, but such predictions computed from the harmonic constants are always sufficiently accurate for the general requirements of navigation. For Standard ports the heights of the tide at times between high and low water may usually be found within narrow limits in accordance with the instructions in Parts I and III of the Tide Tables.

The datums of Admiralty charts depending on Admiralty surveys vary with the type of tide, but usually conform with the International agreement, that datum should be "a plane so low that the tide will but seldom fall below it." The datums used by different nations, however, differ very considerably and those of Admiralty charts depending on foreign surveys are always those used by the original surveyors, which vary from "lowest possible low water" to "mean low water" in tidal waters, and are usually mean sea level in non-tidal waters.

The datum used is always stated on large-scale Admiralty charts.

Caution.—Most datums are above the lowest level to which the tide may fall; the charts therefore do not always show minimum depths.

(13) **Tidal streams.**—Where the tidal streams are semi-diurnal information regarding them is usually given, in a convenient part of the chart, in tabular form or by notes, special symbols being inserted at the positions to which the information refers. In certain cases, where the information available is incomplete, the streams are indicated by means of arrows.

There are many places where the tidal streams cannot be predicted by reference to the tide at a Standard port. Although no data for predicting the times at which they flow is given, their general direction is, in many cases, indicated by arrows on the charts. For a few of the straits and channels, where these conditions exist, tidal stream predictions are given in Admiralty Tide Tables.

Tidal streams, particularly if rotary, may vary considerably both in direction and rate; predictions of the stream must therefore always be considered approximate.

The turn of the tidal stream is not usually coincident with the times of high and low water; in fact, though in estuaries, harbour entrances &c., the stream usually turns at about the times of high and low water, in open channels, and along open coasts generally, the turn usually occurs more nearly at half-tide. Predictions of the times of high and low water must therefore never be used as predictions of the times of slack water.

It should be remembered that, even where the general direction of the stream is parallel with the shore, an indraught is usually experienced when crossing the entrances to bays and inlets.

(14) **Fixing positions.**—For further information on this subject, see Admiralty Manual of Navigation.

When in sight of land, every opportunity should be taken of fixing the ship's position by terrestrial objects.

(a) *Simultaneous bearings or angles.*—The most usual method is by compass bearings of suitable objects, and it must be borne in mind that a fix by only two bearings is liable to error, either an absolute error in taking the bearings, or those made in applying the deviation or in laying the bearings off on the chart. For these reasons, a third or check bearing of some other object should, when possible, be taken, especially when near the shore or dangers. The coincidence of the resulting three lines will prevent any mistakes if the objects are suitably placed. 5

The position may also be fixed by observing horizontal sextant 10 angles of well-defined suitably placed objects. These angles may be plotted on the chart with a station-pointer. Two conditions are, however, necessary to its successful employment; first, that the objects be well chosen; and, second, that the observer is skilful and rapid in his use of the sextant and station-pointer. For the former, 15 reference can be made to the pamphlet on the use of the station-pointer, or to the Admiralty Manual of Navigation; the latter is only to be obtained by practice.

It will readily be seen that a sextant often offers advantages, as angles can be obtained from any position whence the objects are 20 visible, and the fix is in no way dependent on the compass.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either 25 taking or plotting a bearing under such circumstances may put the ship ashore.

In all cases where great accuracy of position is required, such as the fixing of a rock or shoal, or the addition to a chart of fresh soundings or new buildings, angles should invariably be used. In such cases 30 angles should be taken of a number of objects, five being a good number, since this not only fixes the position beyond doubt, but also affords a useful check on the accuracy of the chart itself. When running a line of soundings it is only necessary to take a third angle every now and then, firstly to make certain that the more important soundings, 35 as at the end of a line, are correctly placed, and secondly to check the general accuracy of the chart.

Sometimes when only one of the selected objects is visible from the compass, a compass bearing of it and a sextant angle to the other may be used to fix the position. 40

(b) *Simultaneous bearing and distance.*—Attention is also directed to the very useful and handy method of fixing by the bearing and distance of a suitable object.

Should the ship be supplied with ranging equipment, its use here is obvious, but without it a very good approximate distance of an 45 object of known height may be obtained by observing its angle of elevation and obtaining its distance from Lecky's Offshore Distance Tables, which are supplied with all sets of charts. Full directions for the use of these Tables are given with them.

(c) *The running fix.*—If two position lines are obtained at different 50 times the position of the ship may be found by transferring the first position line up to the time of taking the bearing for the second position line. The point of intersection of the second and the transferred position line is the ship's position at the time of the second observation.

The accuracy of this fix will depend on the accuracy of the estimated 55 run (over the ground) between bearings and, therefore, it is essential

to take great care that an accurate allowance is made for tidal stream, current, and leeway experienced by the ship during this interval.

The method of fixing by doubling the angle on the bow is useful when passing points of land, &c., in waters where there is either no tidal stream or current, or where this can be estimated with sufficient accuracy.

This method is as follows:—

Suppose that the angle between the ship's head and an object is measured, and found to be X° , and that the time of the observation is noted. Suppose also that the time is again taken when the angle between the ship's head and the object is $2X^\circ$. Then, if the course made good is the course steered, the distance of the ship from the object at the time the second bearing was taken is equal to the run (over the ground) in the interval. Hence the ship's position can at once be laid off as a bearing and distance from the object. In practice the angle X should not be less than about 25° .

The most usual form of this method, the so-called "four-point" bearing, gives a good fix for a departure, but does not ensure safety, as the point and any dangers that may lie off are abeam before the position is obtained.

The above fix is reliable when there is no tidal stream or current or when it runs directly with or against the course of the ship. When the stream or current runs across the course of the ship or when leeway is to be allowed for, this method should never be used and the ship's position should be obtained by plotting the two bearings as a running fix.

A table "Distance of an object by two bearings" is supplied with certain chart folios, and is also given in Inman's Tables, by which the ship's position at the second bearing can be found: any two bearings at a suitable angle to each other may be used, together with the run between them, but again, this table should not be used when the vessel is subject to a cross tidal stream or leeway.

(d) *The danger angle.*—The use of the danger angle in passing outlying dangers with land behind them should also not be forgotten.

A vertical danger angle is useful when the danger lies off an object such as a lighthouse, the height of which is known; the angle being obtained from the aforesaid Lecky's Tables. If a horizontal danger angle between two objects is used, however, caution is necessary, as, should the objects not be correctly placed on the chart, the angle taken from it may not serve the purpose. This method should not, therefore, be employed when the survey is old or manifestly imperfect.

(e) *The astronomical position line.*—When fixing by astronomical observations, attention is drawn to the great utility of the position line. Even a single position line may at times give invaluable information, as the ship must be somewhere on this line, provided that the chronometer error is accurately known.

A sounding obtained at the same time may often serve to give an approximate position. Again, by steering along, or at a required distance parallel to, a single position line, a vessel may make her port or avoid a danger, although uncertain of her position.

A very accurate position may be obtained by observations of three or more stars at evening or morning twilight, or by the observation of a bright star at daybreak and another shortly afterwards of the sun when a few degrees (not less than 10°) above the horizon. The position lines obtained from the bodies observed should differ in azimuth by 30° or more.

Mariners are also reminded that, with modern tables for correcting the altitude, observations of the moon entail practically no more calculation than those of a planet. Moon sights are sometimes available when stars are obscured by light cloud, &c.; also, an excellent position may frequently be obtained by simultaneous observations of the sun and moon. 5

(f) *The radio position line.*—A number of radio systems of which the principal ones are M/F D/F, Radio Beacons, Consol Beacons, Loran, Gee and Decca, are now in general use from which position lines or fixes may be obtained. 10

The accuracy and range which may be obtained from these systems vary considerably; their great advantage over other methods lies in the fact that they can be employed under all weather and visibility conditions, though in some cases the results obtained will vary between day and night. 15

Special receiving equipment is generally required in order to make use of the radio signal, and some systems require special lattice charts or tables for plotting the position lines. Full details of these systems and their coverage areas are contained in Admiralty List of Radio Signals, Volumes II and V. 20

The mariner should appreciate that with the position-fixing systems the accuracy of a fix will depend on three factors:—

- (i) The distance of the observer from the transmitters.
- (ii) The bearing of the observer from the base line joining the pair of stations which he is using. 25
- (iii) The angle of intersection of the hyperbolic position lines.

It should be apparent from the inspection of any lattice chart that an inherent small equipment error, or a small personal error that may occur at the receiver, will cause a geographical error of varying amount according to the observer's position. 30

It is important to realise that accurate equipment is no guard against the vagaries of the propagation of radio waves. The beacons and systems operating on medium and low frequencies are liable to "night error" in areas where the ground and sky waves are received with equal strength; these areas will occur at ranges depending upon the particular frequency used by any beacon or system. Where the transmission of two stations are synchronised to provide one signal reading and position line, "night error" will be a minimum along the normal to the base line joining the pair of stations, and a maximum towards the limits of their service sector. 40

Little is yet known about the effects of hills and discontinuities in the terrain (such as cliffs) on the speed of medium- and low-frequency radio waves.

At the other end of the radio spectrum the transmissions of systems operating on the very high frequencies are subject to distortion in abnormal atmospheric conditions. 45

(g) *Fixing by radar.*—Radar may also be of considerable assistance when navigating in coastal waters in low visibility or at night. It is essential, however, to appreciate the limitations of a radar set when interpreting the information obtained from it. It must be remembered that the radar horizon is only slightly farther than the usual horizon would be, in good visibility, for a height of eye equal to the height of the radar aerial. Hence no echoes will be received from a coastline lying below the radar horizon, while echoes may be received from high ground farther inland which will give a misleading impression of the range of the nearest land. 50

Depending on the width of its beam, the bearings from a radar set tend to be inaccurate. It is therefore preferable when fixing by radar to use ranges rather than bearings. It is then most important to consider carefully the identity of the object giving the echo, using the bearing as an indication, and the height of the object to determine whether it will appear on the radar presentation. Radar Range Nomograms are useful in deciding this, but a satisfactory result can be obtained by using "Distance to Sea Horizon Tables."

- When two or more objects on the radar presentation have been selected and positively identified, a satisfactory fix can be obtained by striking arcs on the chart with the radar range of the selected objects. These arcs intercept at the ship's position. Best results will be obtained by using isolated objects such as detached lighthouses, rocky islets, and the extremities of long piers or jetties, but where no such objects are available a steep coastline with cliffs should be used. Flat or gently shelving coastlines, such as mud flats or sand dunes, should not be used since it is difficult to identify any portion of them on the radar presentation. Identification is assisted in some areas by fitting objects, such as buoys and beacons, with radar reflectors, causing them to return strong echoes. Attention is drawn to the symbols with which such objects are marked on Admiralty Charts, and which are given in the latest edition of Chart No. 5011, "Explanation of signs and abbreviations used on Admiralty Charts."
- The difficulty of positive identification of objects is largely reduced if a Chart Comparison Unit is used in conjunction with the navigational radar. Fixes obtained with this equipment employ, in principle, an infinite number of ranges of the terrain in the vicinity of the ship, and in so doing a satisfactory fix will normally be assured.
- In addition, radar beacons are available in some areas. Details of these and their use are given in the Admiralty List of Radio Signals, Volume II.

- (15) **Observations for errors of the compass.**—No opportunity should be neglected for checking the error of the compass. When coasting, and a well-surveyed and fairly large-scale chart is available, an excellent method of observing the error is by taking the compass bearing of two suitable objects when in transit, and comparing this with the charted bearing; there should be sufficient distance between the objects to provide a sensitive transit. When this method is not available the error should be obtained by azimuths of a heavenly body. Errors should be observed on any change of course on which the ship is steadied for a reasonable time, and at least twice a day when steering a steady course for long periods.

- (16) **Change of variation of the compass.**—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a degree, but the chart plates cannot be corrected more frequently from the impossibility of making alterations often on one spot in a copper plate.

- The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10°

in less than 500 miles, and in the English channel about 5° in 400 miles. The Variation chart should be consulted on this head.

On certain general charts embracing large areas with considerable change of variation, true compasses are placed instead of magnetic compasses, the variation being shown by *isogonic lines* (curves of equal magnetic variation), in a similar manner to the Variation chart. One or two *isogonic lines* are also sometimes placed on charts, in addition to the magnetic compasses, in order to indicate the general direction of these curves, and thus facilitate the determination of the variation to be employed in portions of the chart not in immediate proximity to any one of the engraved compasses. Magnetic variation values shown on Admiralty charts are for the 1st July of the year mentioned prior to 1955, and for 1st January subsequent to that year.

(17) Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places on the globe. Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such a rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic ores in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together. Such areas are depicted by a special symbol on charts, and the cause of the magnetic disturbance is referred to as a Local Magnetic Anomaly.

They may also be due to wrecks lying on the bottom in moderate depths, but investigations have proved that, while deflections of unpredictable amount may be expected when very close to such wrecks, it is unlikely that deflections in excess of 7° will be experienced, nor should the disturbance be felt beyond a distance of 250 yards.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

(18) Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:—

1. On free waves, i.e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

5 6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

At anchor, when the sea is sufficient to render it difficult to hoist up or in boats, oil bags from forward or from the swinging booms 10 have been found to render the sea alongside comparatively smooth.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: 15 hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow and 20 allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem 25 the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan. As before remarked, 30 under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this 35 case must greatly depend upon the set of the current, and the depth of the water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead 40 of the boat, and the bag can be readily hauled on board for refilling if necessary.

12. Towing a vessel in a heavy sea, oil is of the greatest service, and may prevent parting the hawser. Distribute from the towing vessel forward and on both sides; if used only aft the tow alone 45 gets the benefit.

(19) **Mirage and abnormal refraction.**—An unusual lapse rate of temperature (and therefore density as well) with height immediately above the sea (or land) surface produces a distortion in the appearance of objects near the horizon; such a phenomenon is known as 50 mirage.

When the surface is relatively cold (and the wind very light) so that the density of the air decreases rapidly for a short distance above the surface, light rays from objects low down near the horizon are bent down, the same way in fact as are usually the rays of the sun when 50 entering the earth's atmosphere at a low altitude. The effect is to render visible objects that are normally below the horizon, e.g., lights

may be "raised" at night at much greater distances than one would ordinarily expect. This phenomenon is known as "looming."

A further occasional effect produced when the air is appreciably warmer than the sea, is "superior mirage" in which an inverted image is seen over the real object; sometimes an erect image is seen immediately above and touching the inverted one. The object and its images in this instance are well defined in contrast to the shimmering object and image of the inferior mirage. Superior mirage is most often experienced in high latitudes and wherever the sea surface temperature is abnormally low.

"Inferior mirage," the effect of which is to decrease the distance at which objects are visible in a horizontal direction, is due to a rapid increase of density with height close to the surface such as occurs when air of comparatively low temperature blows over a warmer sea, or over a tarred road or desert when a hot sun is beating down on it. In either event light rays are bent up when approaching the surface where the density of the air is much less than above. The coastline, and at times a ship or island, may appear to be floating in air above a shimmering horizon, possibly with, in the former instance, her hull either invisible or with an inverted image underneath. Inferior mirage is comparatively uncommon at sea and is more likely to be observed along a coastline than well out to sea.

When mirage is evident caution must be used in taking sights with a sextant, for abnormal refraction must necessarily be present also. With inferior mirage better, but not normal, results will usually be obtained by ascending as high as possible in the ship; with superior mirage the height of eye should be as low as possible. It is, however, advisable, whenever abnormal refraction is suspected, to measure the elevation of the celestial body above the back as well as the front horizon as explained in navigational text-books.

(20) **Aurora.**—The most common form of aurora is an arc system, single or multiple, narrow and well defined, or broad and diffuse, and centred on the magnetic meridian.

The most usual colour is pale whitish green when the auroral activity is weak and diffuse: but when the aurora arises high towards the zenith in the form of rays, rayed curtains and draperies with much rapid movement of the constituent rays, the colours sometimes become much stronger and more vivid, and include bright green, red and violet. When the curtains forming the aurora converge to form a corona, which may rotate very rapidly about the point of convergence, the displays may become very complex, filling practically the whole sky, and extending far to the equatorial side of the zenith with much rapid movement and change of colour from instant to instant.

Though the most usual duration of auroral displays in these high latitudes is several hours, they not infrequently last throughout the whole night from dusk to dawn. In such long displays the really intense and violently active periods with vivid strong colours are generally confined to spasms of 15-30 minutes, with the intervening periods filled with diffuse glows or quiet arc systems.

The absolute intensity of the light of the aurora is seldom great, and the brighter stars usually glimmer through it. In the most vivid and intense displays, the light may equal, but rarely surpasses, that of the full moon in a cloudless sky. It may give enough light to read by. On such occasions the aurora may be visible to some extent in partial twilight.

Though in high latitudes aurora occurs any time in the dark hours

it is probably most frequent in the late evening hours from 9 p.m. till midnight or just after; it is more frequent in the equinoctial months than at other times and has a well-defined 11-year period of activity following the cycle of solar activity. A maximum of activity occurred in 1948, and the interval from maximum to minimum activity usually occupies a period of about 6 to 7 years. In high latitudes this cycle of activity is reflected more in the intensity and vividness of the displays than in the frequency of occurrence. Though really outstanding displays tend to occur around the years of maximum activity they may occur at any time of the cycle, except perhaps near the absolute minimum.

In addition to this 11-year cycle of activity active periods tend to recur at intervals of 27 days, *see* Magnetic Storms.

Northern hemisphere.—Aurora Borealis occurs most frequently along a zone which forms an approximate oval, of average radius 23° , with centre in the extreme north-west of Greenland. This zone of maximum frequency crosses Hudson Bay and the Labrador coast in about lat. 58° N. It runs south of Cape Farewell and along the south coast of Iceland. It lies just north of North Cape, touches the extreme north of Novaya Zemlya, skirts Cape Chelyuskin and then eastward just north of Wrangel Island into the north of Alaska. Along this zone aurora of some kind can probably be seen every suitable night when the sky is clear; 250 miles outside this maximum zone to the southward the auroral frequency decreases sharply to about 70–100 nights a year on the average, and to 20–25 nights 500 miles south of the maximum zone. Inside the maximum zone the geographical distribution of frequency is not so well established but it probably falls off more gradually than it does outside.

On the zone of maximum frequency itself aurora appears as frequently to the south of the zenith as to the north, but with increasing distance outside the zone the appearances concentrate more into the northern sky; the reverse is true inside the zone.

Southern hemisphere.—The frequency and distribution of Aurora Australis is not fully known. It is probable that it is more frequently seen at sea between about long. 50° E. and 175° W. than in other longitudes. Very fine displays have occasionally been seen in Australasia and on passages across the Southern Ocean. There is nevertheless a general impression that aurora is less frequent in the southern than in the northern hemisphere. This is probably to be accounted for by the fact that, apart from whaling and exploring expeditions, ships' tracks in general do not extend to such latitudes as in the northern hemisphere.

The zone of maximum auroral frequency is roughly annular and is near the circumference of a circle of radius about 1,080 miles, centred in about lat. 75° S., long. 129° E. The frequency falls off both outside and inside this zone. A large part of the zone is within the continent of Antarctica.

(21) **Magnetic storms.**—Magnetic storms vary in intensity and frequency with the sunspot cycle, similarly to aurorae. An intense magnetic storm is always accompanied by a bright and active aurora. The deeply coloured aurorae, showing more pronounced red and green, and sometimes also blue and violet, tints, are invariably connected with magnetic storms of considerable or great intensity. Such a storm will produce simultaneous aurora in both hemispheres. In the greatest storms aurorae in some form may be visible down to about 20° north latitude in certain parts of the oceans, especially

between the meridians of 30° W. and 140° W. Magnetic storms vary greatly in duration from a few minutes to several days; they are generally more intense during the hours of darkness. Long-continued storms usually show great fluctuations with periods of complete or partial quiescence. Similarly the associated aurora fluctuates between 5 active and quiescent forms.

The origin of magnetic storms and aurorae is not yet fully understood, but they are intimately connected with the state of a local area of the sun. As the same part of the sun is again presented to the earth after an interval of about 27 days, a magnetic storm and aurora may 10 recur at this time, usually in less intense form.

A ship's compass may tend to deviate during the progress of a considerable magnetic storm. In more intense storms the compass needle may oscillate 1° or more either side of its normal position. Such oscillation may persist for as long as 10 or 20 minutes before 15 dying out. Further oscillation may occur after a period of quiescence. Deviations of 2° or more are rare, but during the great magnetic storm and aurora of January 25th, 1938, one of 4° to the eastward was observed off the Portuguese coast. During a severe magnetic storm the compass may be deflected continually in one direction to 20 the extent of about half a degree for some hours. When bright aurora is seen, especially if it is of the more deeply coloured and rapidly moving kind, and particularly when it is observed in low latitudes, the possibility of deflections of the compass should always be borne in mind. 25

During a considerable magnetic storm freak wireless reception may occur on certain waves and short-wave transmission may fade to complete silence. Beam radio communication, especially in a west-east or east-west direction, may be interrupted. Such conditions may last in some degree over a period of several days, at times when 30 the sun is unusually active. Short-wave fading also occurs occasionally from a different form of solar disturbance known as a "bright eruption," when this is very intense. On the average such fading begins about 7 minutes after occurrence of the bright eruption and may last 5 or 10 minutes, gradually returning to normal within a 35 period of 40 to 45 minutes. These fadings are confined to the daylight hemisphere of the earth, while the magnetic storm fadings may occur by day or by night.

GENERAL METEOROLOGY.

(All the following articles do not apply to every Pilot, but articles 40 applicable to this Pilot will be referred to in the Climate and Weather Section in Chapter I.)

(1) **Lows.**—A low, or depression, appears on a synoptic chart as a series of isobars roughly circular or oval in shape, surrounding an area of low pressure. It is a main feature of the weather at sea in 45 middle latitudes where it is responsible for most of the occasions of strong winds and unsettled weather, though not all depressions are accompanied by strong winds.

Lows vary very much in size and depth; one may be only a hundred miles in diameter and another over two thousand miles; some are 50 deeper than others, a deep low being one in which the pressure is very much lower near the centre than on the outside whereas, on the other hand, a shallow depression is one where the pressure, although low near the centre, is not very much lower than in the surrounding districts.

Note.—The bracketed equivalents hereunder refer to the Southern Hemisphere.

In the northern (southern) hemisphere the winds blow round an area of low pressure in an anti-clockwise (clockwise) direction; there is also a slight inclination across the isobars towards the lower pressure. Thus the well-known rule for the northern (southern) hemisphere is that when an observer faces the wind the direction of the lowest pressure is from 8 to 12 points to his right (left). The strength of the wind is in all instances closely related to the steepness of the barometric gradient or distance apart of the isobars; the closer the isobars the stronger the wind.

Lows may move in almost any direction, though most often towards north-east (south-east) or east, at a speed of anything between 10 and 40 knots, though occasionally as much as 60, during the middle and most active stage of their existence; they slow down when filling up (see "occlusion" below). The life of a low is in the region of 4 to 6 days.

There are usually one or more fronts, probably radiating from the centre, in the area covered by a low; each front on a synoptic chart represents a belt of relatively bad weather, accompanied by a veer (backing) of wind, which marks the change from the weather characteristic of one air mass to that of another. During the first two or three days of its life a low has a warm and a cold front, the area between the two being known as a warm sector because the air has come from a warmer locality than that which is outside the sector (see Fig. 1a). Warm air is lighter than cold air and it rises over the cold air ahead of the warm front as shown in Fig. 1b; this causes condensation of the water vapour in the warm air, forming at first cloud and later drizzle or continuous steady rain. The cloud spreads out ahead of the warm front, and the highest cloud, cirrus or mares' tails, is often about 500 miles ahead. At the rear boundary of the warm sector, known as the "cold front," the cold air is pushing under the warm air forcing the latter to ascend rapidly; this process is sometimes violent enough to produce squalls. The rapid ascent of the warm air causes the moisture to condense in the form of cumulo-nimbus clouds (shower clouds), from which heavy showers may fall. The cold front gradually overtakes the warm front so that the warm sector is eventually lifted up from the earth's surface. When this has occurred the low is said to be occluded, and the warm and cold fronts have merged into the third type of front known as an "occlusion" (see Figs. 2a and b). When a low has become occluded, it usually decreases in intensity and rate of travel, and gradually fills up. On the other hand, a low which has a marked warm sector is likely to be deepening, the winds associated with it may increase in force and its rate of travel may increase. Lows are usually travelling in a direction approximately parallel to the isobars (and in the direction of the wind) in the warm sector.

The approach of a low is indicated by a falling barometer. In the northern (southern) hemisphere, if the low is approaching from westward and passing northward (southward) of the ship, clouds appear on the western horizon, the wind shifts to a south-westerly (north-westerly) or southerly (northerly) direction and freshens, the cloud layer gradually lowers, and finally drizzle, rain or snow begins. If the low is not occluded, after a period of continuous rain or snow there is a veer (backing) of wind at the warm front, a rise of temperature and diminution or cessation of rain (or snow) in the warm sector, the visibility being usually moderate and the sky overcast with low cloud.

The passage of the cold front is marked by the approach from westward of a thick bank of cloud (which however cannot often be seen because of the customary low overcast sky in the warm sector), a further veer (backing) of wind to west or north-west (south-west), sometimes with a sudden squall, rising pressure, a fall of temperature, squally showers of rain, hail or snow, and improved visibility (except during showers). The squally showery weather with a further veer (backing) of wind and drop in temperature may recur while the low recedes owing to the passage of another cold front or occlusion. If the low is occluded, the occlusion is preceded by the cloud of the warm front; there may be a period of continuous rain mainly in front of and at the line of occlusion, or a shorter period of heavy rain mainly behind the occlusion, according as the air in front of the occlusion is colder or warmer than that behind it. There may be a sudden veer (backing) of wind at the occlusion.

Often another low follows 12 to 24 hours later, in which event the barometer begins to fall again and the wind backs towards south-west (north-west), or even south (north).

If a low travelling eastward or north-eastward (south-eastward) is passing southward (northward) of the ship, the winds in front of it are easterly and they back (veer) through north-east (south-east) to north (south) or north-west (south-west); changes of direction are not likely to be so sudden as on the southern (northern) side of the low. In the rain area there is often a long period of continuous rain and unpleasant thick weather with low cloud. In winter in the colder regions the weather is cold and raw and precipitation is often in the form of snow.

Near the region of lowest pressure, lulls are sometimes experienced, but sudden changes are likely, and in a deep low the wind may increase in strength very rapidly, perhaps to gale force as the barometer begins to rise.

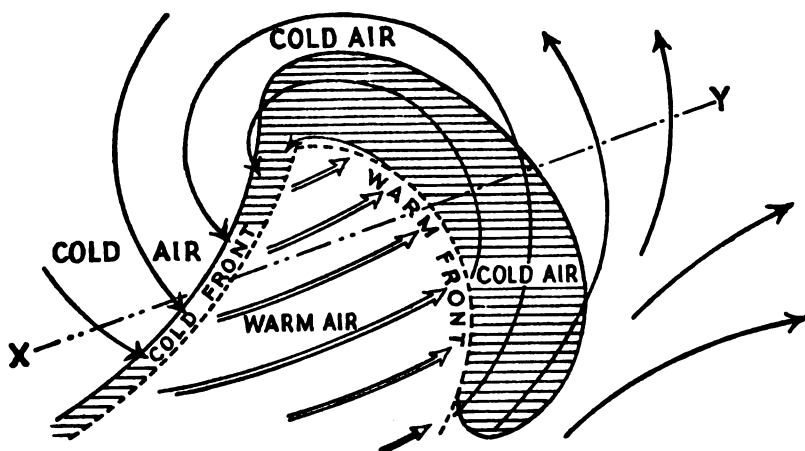
Sometimes in the air circulation of a large low, usually on the equatorial side and often on a cold front, a secondary depression develops, travelling in the same direction as the primary but usually more rapidly. The secondary often deepens while the original low decreases in intensity. In the region between the primary and the secondary depressions, the winds are not as a rule strong; but on the further side of the secondary, usually the southern (northern) side, winds are likely to be strong and they may reach gale force. Thus the development of a secondary may cause gales at a greater distance from the primary than anticipated, while there may be only light winds where gales were expected.

The above is a brief general description of lows and the associated weather in temperate or middle latitudes of the northern (southern) hemisphere. It must be emphasised, however, that individual lows in different localities differ considerably from one another, according to the characteristics (especially the temperature and humidity) of the air currents of which they are composed, and the nature of the surface over which they are travelling.

(2) **Tropical revolving storms.**—*Practical rules for avoiding them.*—These storms are so named because the wind blows round an area in which the lowest pressure is at the centre. The direction of rotation is anti-clockwise in the northern hemisphere and clockwise in the southern hemisphere. The wind does not revolve round the centre of low pressure in concentric circles but has a spiral movement inwards towards the centre of the storm field.

NORTHERN HEMISPHERE

Fig. 1a.

*Plan of a developed depression.*

The double lines show the flow of the warm air, and the single lines the flow of the cold air.
 The shading shows the areas where rain (or snow) is most probable.
 Width of rain belt ahead of warm front is generally between 100 and 200 miles.

Fig. 1b.

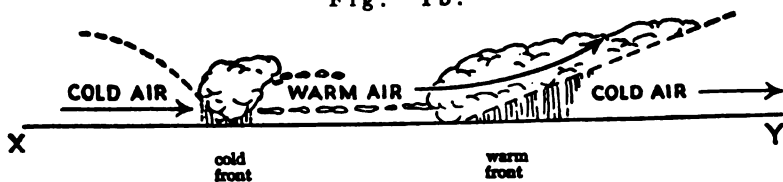
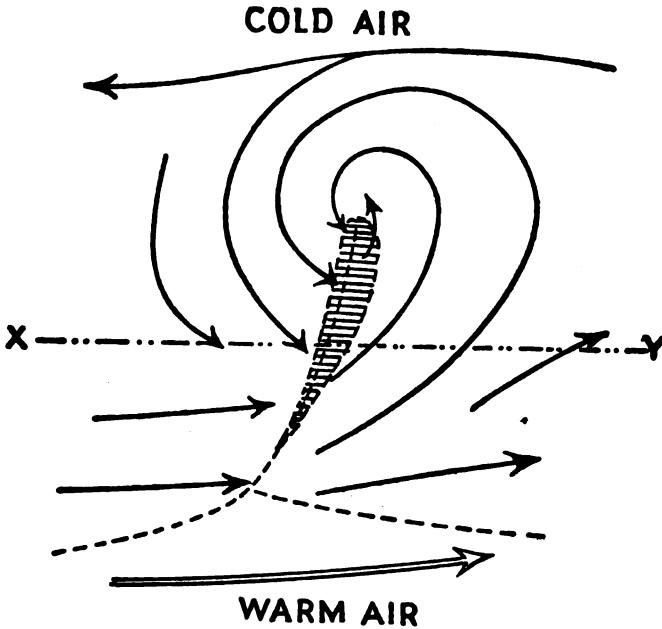
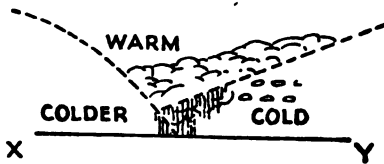
*Vertical section of the depression along the line XY.*

Fig. 2a.

*Plan of an occluded depression.*

The shading shows where rain (or snow) may be expected near the occlusion.

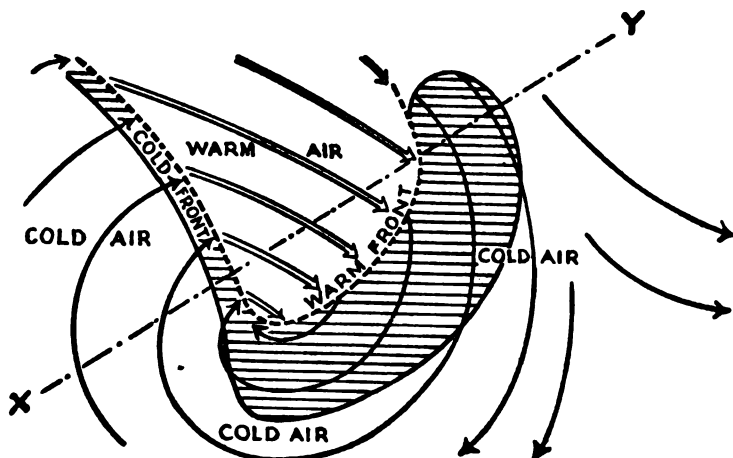
Fig. 2b.

*Vertical section of an occlusion of the cold front type.*

The air in front of the occlusion is warmer than the air behind it.

SOUTHERN HEMISPHERE

Fig. 1a.

*Plan of a developed depression.*

The double lines show the flow of the warm air, and the single lines the flow of the cold air.
 The shading shows the area where rain (or snow) is most probable.
 Width of rain belt ahead of warm front is generally between 100 and 300 miles.

Fig. 1b.

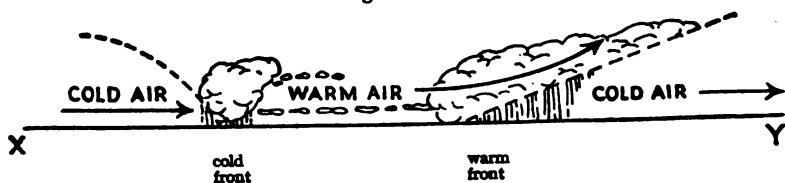
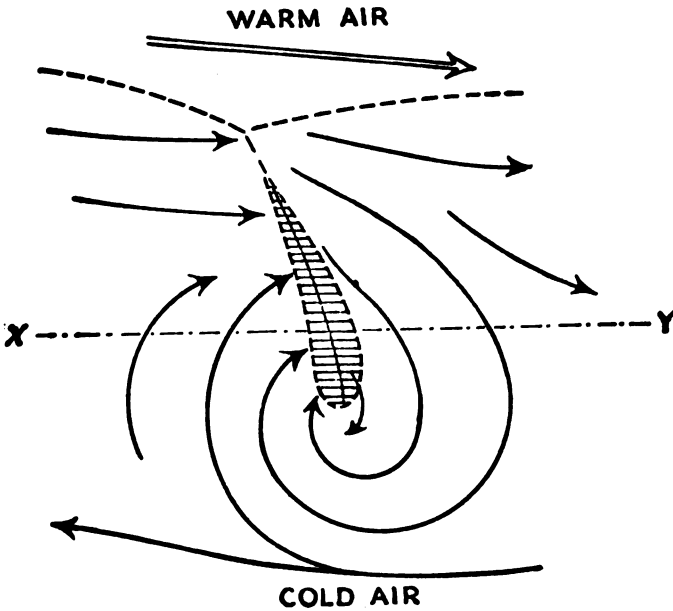
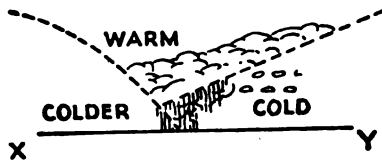
*Vertical section of the depression along the line XY.*

Fig. 2a.

*Plan of an occluded depression.*

The shading shows the region where rain (or snow) may be expected near the occlusion.

Fig. 2b.

*Vertical section of an occlusion of the cold front type.*

The air in front of the occlusion is warmer than the air behind it.

A tropical storm is not so extensive as the depression of higher latitudes but, within 75 miles or so of the centre, the wind is often far more violent, and the high and confused seas near the centre may cause considerable damage to large and well-found ships, while small vessels (for example, destroyers) have foundered. The danger is still greater when ships are caught in restricted waters without adequate room to manœuvre. Within 5 to 10 miles of the centre the wind is light or moderate and variable, the sky is clear or partially so, and there is a heavy, sometimes mountainous, confused swell; this area is known as the "eye" of the storm. After passing through the relatively windless centre of the storm the wind will suddenly, and with great violence, commence to blow from a direction almost opposite to that experienced on the other side of the windless centre. Due to torrential rain and sheets of almost continuous spray, visibility near the storm centre (but outside the "eye") is almost nil.

Every ship navigating in an area subject to tropical storms during the season of their occurrence should be constantly on the alert for any sign of their approach, so that steps can be taken to avoid the danger zone while there is still time and sea-room.

Localities, season, and average frequency.—Tropical storms occur for the most part on the western side of the oceans, though they are also experienced in the Bay of Bengal, off the north-west coast of Australia, and off the west coast of Central America. They are unknown in the South Atlantic. They are given various names according to the part of the World in which they occur.

30	Western North Atlantic	}	hurricanes
	Eastern North Pacific		
	South Pacific		
	Western North Pacific	}	-typhoons
	Indian Ocean		
	Bay of Bengal	}	-cyclones
	Arabian Sea		
	North-west Australia		-willy-willies

They are most frequent during the late summer and early autumn of their hemisphere; they are comparatively rare in the southern hemisphere from mid-May to November, and in the northern hemisphere from mid-November to mid-June. In the Arabian Sea, however, storms are most likely to occur at the change of the monsoon, i.e., October-November, and May-June, though they average only one or two a year. Out-of-season storms occur from time to time, particularly in the western North Pacific where no month is entirely safe, and in the Indian Ocean where one is reported south of the Equator perhaps once in two years outside the usual season. The following table shows approximately the average number of severe tropical storms recorded per annum, from statistics taken over several years for the various areas:—

50	West Indies	5
	Western North Pacific	25
	South Pacific	3
	Southern Indian Ocean	6
	Bay of Bengal	2
	Arabian Sea	1
	Eastern North Pacific	3
	West Coast of Australia	1

Variations in any one year amounting to 50% above or below the average are not unusual. Some of the figures quoted are probably an underestimate since in the less-frequented parts of the world many storms must escape detection.

Origin, movement and extent.—Tropical storms originate as a general rule in the doldrums, between the parallels of 7° and 15° of latitude; those which affect the western part of the Pacific, South Indian and North Atlantic Oceans are first reported in the western third of those oceans, though there are exceptions such as in the North Atlantic during August and September where an occasional storm is known to begin near the Cape Verde islands. In the northern hemisphere they move off in a direction between 275° and 350°, though most often within 30° of due west. When in a latitude of 25° or so they usually recurve away from the equator and, by the time they have reached the 30th parallel, the track (or path as it is more usually called) is north-easterly. In the southern hemisphere they move off in a WSW. to SSW. direction (usually the former), recurve at about 15° to 20° S., and thereafter adopt a south-easterly path. In either hemisphere many storms do not recurve but continue in a west-north-westerly (or west-south-westerly) direction until they reach the mainland where they quickly die.

The speed of advance of these storms is usually about 10 knots in their early stages, increasing a little with latitude; it seldom exceeds 15 knots before recurving, but after recurving 20 to 25 knots is usual though speeds of 40 knots or even more have been known.

Occasionally storms move erratically, the path turning towards the equator, or adopting an easterly component in a low latitude, or even making a complete loop, but on these occasions their speed of advance is low, usually less than 10 knots, while the unusual path is being followed.

The extent of the storm area varies considerably with individual storms but, generally speaking, winds of force 7 or more are improbable at more than 200 miles (especially on the equatorial side of the storm area) and force 8 is unlikely to be exceeded at more than 100 miles, from the storm centre, if in a latitude of less than 20°. Thereafter the radius increases with latitude so that these distances are nearly doubled on reaching the 35th parallel, but the intensity diminishes near the centre. Hurricane force winds are likely within 75 miles of the storm centre in the tropics, and gusts exceeding 150 knots have been reported in a few instances within 50 miles or so (except in the eye of the storm). The aim of the mariner should therefore be to remain as far as possible from the centre of the storm system.

Warning of existence or approach.—In most instances, warning of the position, intensity and probable movement of a storm is given by radio at frequent intervals by meteorological authorities ashore. (See Admiralty List of Radio Signals, Volume III.) Sometimes, however, there is insufficient evidence available for an accurate warning or even a general warning to be given and ships must then be guided by their own observations. Of the following indications of the proximity of a tropical storm, the first is by far the most reliable within 20° or so of the equator; it should be borne in mind, however, that very little warning may be expected of the approach of an intense storm of unusually small diameter.

(a) If the corrected barometer reading is 3 mb. or more below the mean for the time of year, as shown in a climatic atlas or on the appropriate chartlets in the meteorological text of this Pilot,

- suspicion should be aroused and action taken to meet any development, such as raising steam in any available additional boilers, &c. It should be noted, however, that the barometer reading must be corrected not only for height, latitude, temperature and index error (if mercurial), or for height and index error if aneroid, but also for diurnal variation, the amount of which is given for each hour of the day in the Air Ministry climatic atlases and in the meteorological text of this Pilot. If the reading thus corrected is 5 mb. or more below normal, it is time to take avoiding action for there can be little doubt that a tropical storm is in the vicinity. According to an analysis of observations in the Western Pacific the centre of the storm is then probably not more than 200 miles away. At this distance, at any rate in the China Sea vicinity, the wind has usually increased to about force 6.
- When proceeding through an area liable to be visited by these storms it is desirable to take hourly readings of the barometer.
- (b) An appreciable change in the direction and/or strength of the wind.
- (c) A swell is sometimes evident, proceeding from a direction that approximates to the bearing of the centre. If ahead of the storm this indication may be apparent before the barometer begins to fall.
- (d) Extensive cirrus cloud followed, as the storm becomes closer, by much alto-stratus cloud and subsequently fracto-cumulus or "scud."
- (e) In addition there is the warning that can be given by Radar. The existence of moderate or heavy rain can usually, under favourable meteorological conditions, be detected at the extreme range of centrimetric radar, such as is normally used for navigational purposes afloat, depending on the vertical extent of the rainfall. Subrefraction might decrease and superrefraction increase this range as with any other target. Although moderate or heavy rain does not fall symmetrically all round a storm, it is continuous for at least 50 miles in a broad sector extending from the "eye" of the storm where there is a circular area of relatively light winds and clear or partially clear sky. By the time radar evidence of the exact position of the storm is available, the ship will probably be already in fairly high seas and experiencing winds of force 9 or 10. There should still be time, however, for her to avoid the centre of the storm.

Note.—In accordance with Article 35 of the International Convention for Safety of Life at sea it is the duty of every ship who suspects the presence or formation of a tropical revolving storm immediately to inform other vessels and shore authorities with all the means at her disposal. Weather reports should be made by radio at frequent intervals giving as much information as possible, especially corrected (not for diurnal variation as in (a) above) barometer readings. If barometer readings are uncorrected this fact should be stated in the signal.

Information required by the seaman before deciding upon action to be taken.—To decide on the best course of action if a storm is suspected to be in the vicinity, the mariner requires to know:—

- (a) the bearing of the centre of the storm;
- (b) the semicircle in which the ship is situated;
- (c) the path of the storm.

If an observer faces the wind, the centre of the storm will be from 9 to 11 points on his right-hand side in the northern hemisphere when the storm is about 200 miles away, i.e., when the barometer has fallen

about 5 millibars and the wind has increased to force 6 or thereabouts; as a rule the nearer one is to the centre the more nearly does the angular displacement of the wind approach 8 points. A further check on the bearing of the centre may often be obtained by noting the direction from which the swell is coming. The swell travels approxi- 5
mately directly outward from the storm centre.

The semicircle in which the ship is situated can be determined by taking two such bearings with an interval of from two to three hours between observations, provided that allowance is made for the ship's movement. It can be assumed that the storm is not travelling towards 10
the equator; and, if in a lower latitude than 20° , its path is most unlikely to have an easterly component; and, on the rare occasions when neither of these statements applies, the storm is moving very slowly. (Exceptions to this are most likely in the South Pacific, where occasional storms often move off on a course almost due south develop- 15
ing an easterly component at a latitude of about 15° , and in the western North Pacific where some of the out-of-season storms may recurve at an early stage.)

In a moving ship associated with a storm progressing at an unknown rate, it is very difficult to estimate from an apparent shift of wind the 20
direction and speed of the storm's motion relative to the ship. The surest method of ascertaining the true shift of wind and thereby finding out in which semicircle the vessel is situated, *is to stop the ship during the period between the two bearings*. If in either hemisphere, these observations show that the wind is veering, the ship is in the right-hand 25
semicircle; if the wind is backing she is in the left-hand semicircle; and if the wind remains steady in direction than the vessel is in the direct path of the storm, which is the most dangerous place of all.

The diagram headed "Typical Paths of Tropical Storms" (at the end of this article) illustrates the terms "dangerous semicircle" and 30
"navigable semicircle." The former lies on the side of the path towards the usual direction of recurvature, i.e., the right-hand semicircle in the northern and the left-hand semicircle in the southern hemisphere. It is so called because a sailing or low-powered vessel caught in it may be blown towards the path along which the storm will 35
pass, or the storm may recurve and the centre pass over her. The navigable semicircle is that which lies on the other side of the path. A ship situated within this semicircle will tend to be blown away from the storm centre, and the recurvature of the storm will increase her distance from the centre. 40

Practical rules for avoiding tropical storms.—In whatever situation a ship may find herself, the matter of vital importance is to avoid passing within 50 miles or so of the centre of the storm; it is preferable to keep outside a radius of 200 miles or more, because at this distance the wind does not often exceed force 7 (and is generally not more than 45
force 6), and freedom of manœuvre is maintained. If a ship has at least 20 knots at her disposal, and shapes a course that will take her most rapidly away from the storm before the wind has increased above the point at which her movement becomes restricted, it is seldom that she will come to any harm. 50

Sometimes a tropical storm moves so slowly that a vessel, if ahead of it, can easily outpace it or, if astern of it, can overtake it. Since, however, she is unlikely to feel seriously the affects of a storm so long as the barometer does not fall more than 5 mb. (corrected for diurnal variation) below the normal, it is recommended that frequent readings 55
should be made if the presence of a storm in the vicinity is suspected

or known, and that the vessel should continue on her course until the barometer has fallen 5 mb., or the wind has increased to force 6 when the barometer has fallen at least 3 mb. If and when either of these events occurs, she should act as recommended in the following paragraphs, until the barometer has risen above the limit just given, and the wind has decreased below force 6. Should it be certain, however, that the vessel is behind the storm, or in the navigable semicircle, it will evidently be sufficient to alter course away from the centre.

In the northern hemisphere.—(a) If the wind is veering, the ship must be in the dangerous semicircle. A power-driven vessel should proceed with all available speed with the wind 1 to 4 points (depending upon her speed) on the starboard bow, and should subsequently haul round to starboard as the wind veers, thereby tracing a course relative to the storm as shown by the pecked line in the diagram. If a power vessel has insufficient room to make much headway when in the dangerous semicircle she should heave to in the most comfortable position relative to the wind, preferably with the wind on her starboard bow so that she is heading away from the centre of the storm.

(b) If the wind remains steady in direction, or if it backs, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a power vessel should bring the wind well on the starboard quarter and proceed with all available speed, subsequently altering course to port as the wind backs, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

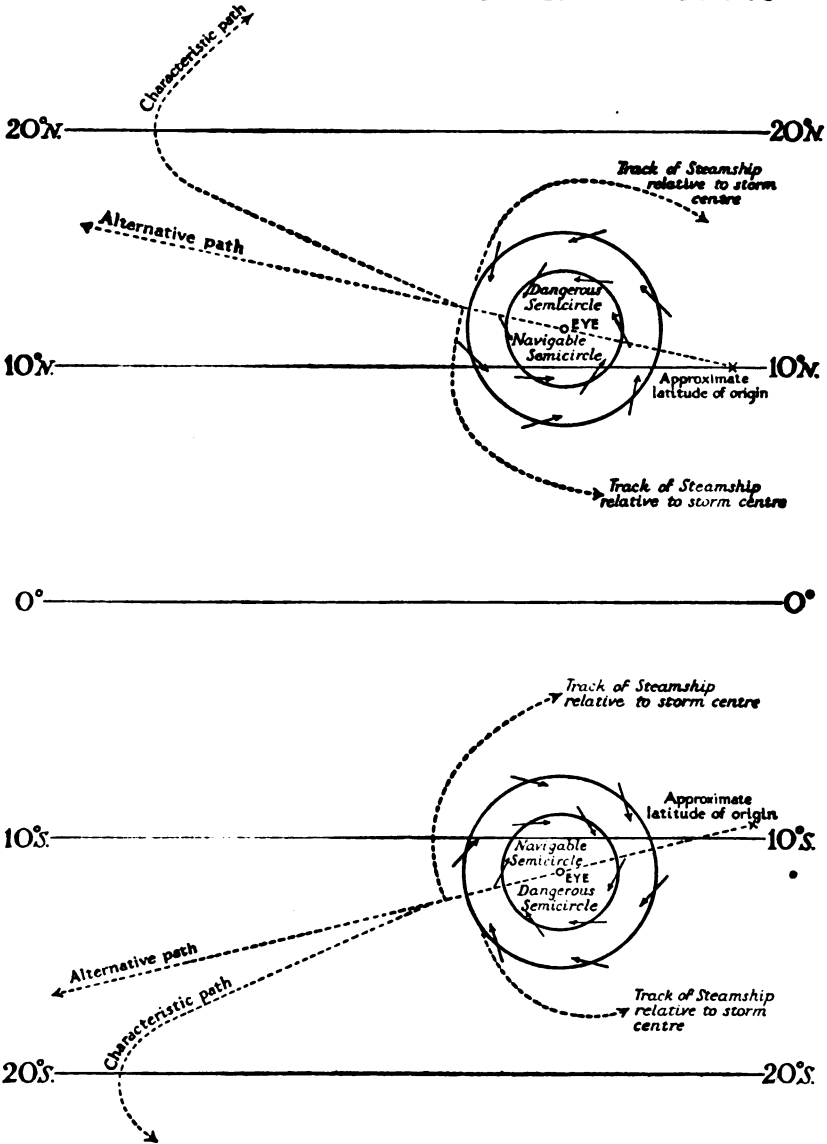
In the southern hemisphere.—(a) If the wind is backing, the ship must be in the dangerous semicircle. A power-driven vessel should proceed with all available speed with the wind 1 to 4 points (depending upon her speed) on the port bow, and should subsequently haul round to port as the wind backs, thereby tracing a course relative to the storm, as shown by the pecked line in the diagram. If a power vessel has insufficient room to make such headway she should heave-to in the most comfortable position relative to the wind, preferably with the wind on her port bow so that she is heading away from the centre of the storm.

(b) If the wind remains steady in direction, or if it veers, so that the ship seems to be nearly in the path (it is sometimes difficult to determine satisfactorily if indeed the ship is nearly in the path, particularly if in the dangerous semicircle, because the wind does not always behave according to rule) or in the navigable semicircle respectively, a power vessel should bring the wind well on the port quarter and proceed with all available speed, subsequently altering course to starboard as the wind veers, thus tracing a course relative to the storm as shown by the pecked line in the diagram.

If there is insufficient room to run when in the navigable semicircle, and it is not practicable to seek a safe and effective shelter before the storm begins to be felt, a vessel should heave-to in the most comfortable position relative to the wind and sea, bearing in mind the proximity of land.

If a ship finds that she is in the direct path of the storm and has no room to run into the navigable semicircle as directed above, it should be considered, bearing in mind possible recurvature, whether she should endeavour to make her way into the "dangerous" semicircle (where

TYPICAL PATHS OF TROPICAL STORMS



Note.—In this diagram the isobars are shown as concentric circles about the eye; in practice this is usually the case within 150 miles or so of the centre. Outside this distance the isobaric form often loses its symmetry and strong winds often extend farther on the polar side than on the equatorial.

she may at least be better off than remaining in the direct path of the storm) and continue to steam to windward as fast as she can so as to get as far as possible from the centre.

If in harbour, or at anchor, a seaman should be just as careful as at sea in watching the shifting of the wind and estimating the movement of the storm relative to himself, so that he may consider shifting his berth with advantage or otherwise act according to circumstances. It is usually preferable, however, to put to sea if this can be done in sufficient time to avoid the worst of the storm. Riding out a tropical storm, the centre of which passes within 50 miles or so, in a harbour or anchorage, even if some shelter is offered, is an extremely unpleasant and hazardous experience, especially if there are other ships in company. Even if berthed alongside, or with special moorings and long bridles in use, a ship cannot feel entirely secure.

Discretion must, of course, be used. In the case of a low-powered or small vessel with, for example, insufficient warning to enable her to gain sufficient distance from the storm by putting out to sea, it will be preferable to remain in a reasonably sheltered harbour. If at sea and warning of an approaching storm is given and there is considered to be insufficient time or sea room to avoid the dangerous part of the storm area, it may be advisable for vessels of this type to seek shelter. In the China Sea, for example, there are so-called typhoon harbours which are listed in the Admiralty Pilot. In all cases, however, the mariner must use seamanship and initiative.

(3) **Local modification of the weather near the coast.**—The meteorological information given in Chapter I takes little or no account of local peculiarities of wind and weather due to coastal topography. These local effects are often unpredictable, especially where the coast has many deep indentations. Nevertheless, the general character of local topographical effects, in the vicinity of a given position, may sometimes be predicted with the help of the following notes.

(i) If the coast is bordered by steep cliffs, or if there are high hills or mountains in the hinterland, approximately parallel with the shore, onshore winds which are only slightly inclined to the coastline are usually deflected so as to blow nearly parallel with the coast, and they increase somewhat in speed. This effect is particularly noticeable in a long strait not more than a few miles wide, and where the strait narrows there is often a big increase of speed.

(ii) When the wind is onshore and nearly perpendicular to the coast, and there are high cliffs, there is usually a narrow belt of contrary gusty winds close to the coast.

(iii) An offshore wind is often squally on the lee side of a hilly coast, especially where the wind is much cooler than the sea surface.

(iv) Land and sea breezes are generally prominent in settled fine weather, especially in latitudes lower than 40° S. or N.

The sea breeze blows from the sea to the land during the daytime, and is generally strongest in the afternoon; it occasionally reaches force 5, and sometimes extends 20 miles or more seaward.

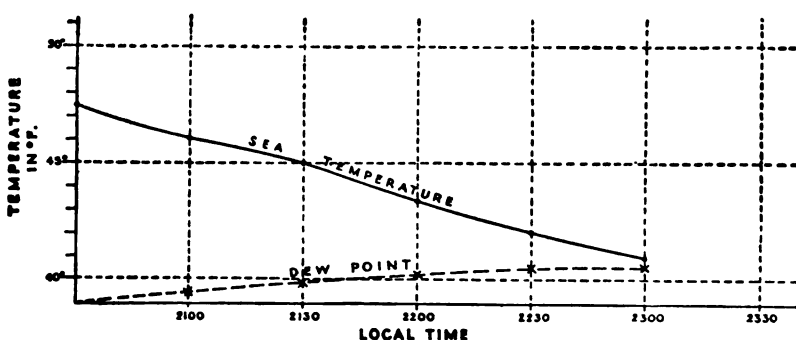
The land breeze blows from the land to the sea. It does not usually begin until a few hours after sunset, but may continue for an hour or two after sunrise. It seldom exceeds force 4, and does not usually extend more than 5 miles seaward.

- (v) When sea fog is general over the open sea, there is nearly always better visibility close to leeward either of a hilly island or promontory, or of any land strongly heated by the sun.
- (vi) Radiation fog, which may form over land on quiet nights with clear skies, sometimes spreads 10 miles or more seaward. In temperate latitudes it is usually most frequent in autumn and winter.

(4) **Forecasting sea fog.**—The most frequent type of fog in the open sea is that caused by relatively warm air flowing over a colder sea. Warning of this type of fog may be obtained by frequent observations of air and sea surface temperatures; if the sea temperature falls below the dewpoint of the air, fog is almost a certainty. The following procedure is recommended whenever the temperature of the air is higher than, or about equal to, that of the sea, especially at night when approaching fog cannot be seen until shortly before entering it.

Sea and air (both dry and wet bulb) temperatures should be observed at intervals of about 5 miles and the sea temperature plotted against dewpoint. The dewpoint is obtainable from tables published in various text-books, but at temperatures up to about 60° F. a close enough approximation may be obtained by assuming it to be the same amount below the wet-bulb temperature as the latter is below the dry-bulb temperature; for example, if the dry bulb reads 50° F. and the wet bulb 48°, the dewpoint is about 46°. If the curves of sea temperature and dewpoint converge, fog may be expected by the time at which they coincide.

The figure below represents conditions that might be found by a low-powered ship in about long. 40° W. proceeding westward on the appropriate lane route for Halifax, Nova Scotia. At 2200 it would become evident that there is a probability of running into fog in about an hour's time, assuming that the sea temperature continues to fall at about the same rate that it has done during the last 1½ hours.



From the appropriate chart of average sea surface temperatures it can be seen where a rapid fall of temperature may be expected, so that if the dewpoint is within 5° or so of the sea temperature when approaching the colder water zone, this will also give a fairly reliable warning of fog.

If it is desirable and practicable to escape from fog, a ship should steer for warmer water which will again be evident from the charted isotherms.

Fog, or very poor visibility, at sea may also occur in snow or heavy rain, or in association with the passage of a warm front or occlusion, or, when within 20 miles or so of land, it may occur as a result of radiation fog extending from the land; in high latitudes in winter, 5 sea smoke may be met near land, when very cold offshore winds are blowing, or near extensive ice. The method described above will not give warning of these fogs, of which frontal fogs, though common in middle latitudes, are neither so extensive nor so persistent in any one locality, and the other fogs mentioned are rarely encountered far from 10 land (or extensive ice).

IMPORTANT.

Details of Lights, Fog Signals, and Time Signals (visual) are not included in this volume; for this information the Admiralty List of Lights, Vols. 6 & 10, should be consulted.

Information regarding Vertical Movement of the Water is not included; for this the Admiralty Tide Tables should be consulted.

Details of Radio information (weather bulletins, storm and navigational warnings, time signals, fog signals, and D.F. stations) are not included; for this information the Admiralty List of Radio Signals should be consulted.

REPORT

The following information was obtained from the records of the Bureau of the Census, Department of Commerce, for the year 1914. The information was obtained from the records of the Bureau of the Census, Department of Commerce, for the year 1914. The information was obtained from the records of the Bureau of the Census, Department of Commerce, for the year 1914.

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EASTERN ARCHIPELAGO PILOT, VOL III.

CHAPTER I

GENERAL REMARKS — TRADE — COMMUNICATIONS — RADIO STATIONS —
FUEL — REAIRS — DERATISATION — STANDARD AND SUMMER TIMES —
PILOTAGE — BUOYAGE — SIGNALS — REGULATIONS — LIFE-SAVING — SUB-
MARINE CABLES — OCEANIC BANKS — TIDAL STREAMS — CURRENTS —
CLIMATE AND WEATHER

GENERAL REMARKS.—This volume contains a description of the south-eastern portion of the Eastern archipelago, namely, the islands that border the route usually followed by power vessels from the China sea, through the Celebes, Molukka and Banda seas towards Australia; it includes a description of the north-eastern extremity of Celebes, the Molukken archipel, the islands in the Banda sea, and the coasts of the western end of New Guinea. 5

EASTERN ARCHIPELAGO.—History.—The history of the present-day Eastern Archipelago appears naturally to fall into two great periods, the dividing line of which lies in about the year 1500. 10 In the period before that date Hinduism held supreme sway in the most important islands; towards the end of the fifteenth century Islam had to a great extent superseded Hinduism, and at the same time the first conquerors from Europe, the Portuguese, arrived. In 1596, the Dutch arrived on the scene, and early in the seventeenth century the Netherlands East India Company acted as the principal political power in the archipelago; by the end of that century it had gained absolute control. 15 A century later these colonies were annexed by the State, so that in the nineteenth century and first part of the twentieth century they formed part of the Netherlands Kingdom. The transfer of sovereignty 20 of the major part of the Eastern Archipelago from the Netherlands to the United States of Indonesia took place on 28th December, 1949. On 15th August, 1950, a new provisional constitution was proclaimed and the country named the Republic of Indonesia.

The Eastern Archipelago is one of the most important volcanic territories of the entire globe; Sumatra and Java form a portion of a volcanic arc which continues eastward throughout Kleine Sunda eilanden. This recent volcanism has made the soil of Java so fertile that it is one of the most densely populated agricultural areas of the world. 25 30

Republic of Indonesia.—The Republic of Indonesia comprises the islands of Java and Madura, the island of Sumatra, Riouw and Lingga

archipels (which with the Karimun, Anambas, Natuna and Tambelan eilanden as well as a part of Sumatra form part of the Province of Central Sumatra), the islands of Banka and Billiton, part of the island of Borneo, Celebes, the Molukken archipel, part of Timor island, 5 and the islands of Bali and Lombok.

The Republic is administered by the President, Cabinet and House of Representatives. The capital of the Republic is Djakarta, in Java; the British Ambassador Extraordinary and Minister Plenipotentiary resides at that place.

10 **Inhabitants.**—The principal races are the Achinese, Bataks and Menangkabaus in Sumatra, the Javanese and Sundanese in Java, the Madurese in Madura, the Balinese in Bali, the Sasaks in Lombok, the Menadonese and Buginese in Celebes, the Dyaks in Borneo and the Papuas in New Guinea, known to the Indonesians as Irian.

15 **Netherlands New Guinea.**—This State, which remains under Dutch sovereignty, consists of the Netherlands part of the island of New Guinea, the islands Kofiau, Salawati, Bantata and Waigeo which, together form the Radja Ampat eilanden, and the islands Misool, Frederik Hendrik and Adi, all this territory was excluded from the 20 transfer to the Republic of Indonesia.

The administration of Netherlands New Guinea is exercised by a Governor assisted by a Government council. As soon as conditions permit a New Guinea Assembly will be elected.

Portuguese Timor.—The north-eastern half of the island of Timor, 25 see Eastern Archipelago Pilot, Vol II, is Portuguese overseas territory, while the south-western half belongs to the Republic of Indonesia.

Portuguese Timor is administered by a Governor and enjoys financial and administrative autonomy.

Talaud and Sangi groups.—These groups are the principal of 30 a chain of islands extending from the north-eastern extremity of Celebes to the southern end of Mindanao, and from their general formation, appear to have been formerly joined to Minahasa. The islands of the Sangi group are entirely volcanic, Gunung Awu, in Sangi, being one of the most formidable volcanoes in the archipelago.

35 **Celebes.**—The fertile and highly cultivated district of Minahasa, occupying the north-eastern extremity of the northern peninsula of Celebes, is the only portion of the island dealt with in this work; for a description of the entire island, see Eastern Archipelago Pilot, Vol. II.

A considerable portion of Minahasa is an uneven plateau of volcanic 40 nature from 2,500 to 3,000 feet (762^m0 to 914^m4) high, with mountains rising to 6,000 feet (1828^m8) or more, the most notable being Kalabat, a well-defined, isolated, cone-shaped mountain 6,631 feet (2021^m1) high. Streams and rivers flow in all directions from these mountains, but none of them are navigable, except for a very short distance by 45 small craft; the most important is Menado rivier, which has its origin in Meer van Tondano, situated in the middle of the Minahasa district.

The chief towns of Minahasa are Menado and Kema, situated on opposite sides of the peninsula, the former used as the chief port during the South-east monsoon, and the latter during the North-west 50 monsoon.

Molukken archipel.—The term “Molucos” was originally applied by the Portuguese to the five islands, Ternate, Tidore, Moti, Makian, and Kajoa, but has gradually been extended to almost all the eastern islands producing spices, and the limits are consequently somewhat 55 vaguely defined. They may be divided into two groups, separated from each other by the Ceram sea: the Noordelijke Molukken consist

of Halmahera with its adjacent islands, the Batjan group, the Obi eilanden, and the islets Maju and Tifore; the Zuidelijke Molukken consist of Buru, Ceram, Ambon, and the Banda eilanden. A great volcanic belt passes through the whole length of the archipelago, giving it its distinctive character, though some of the islands are entirely without volcanoes, either active or extinct, and some appear to be wholly non-volcanic in structure. 5

Because of the unsettled conditions in Zuidelijke Molukken, the capital of the Molukken archipel was temporarily located outside the province in 1960, and is at Tomohon situated at the north-eastern end of Celebes. 10

Noordelijke Molukken.—Halmahera, although almost as large as Ceram, is comparatively unimportant. It is very mountainous and rugged, and has many volcanoes, especially on the western side of the northern peninsula; the highest peak is Gam Konora, which has an elevation of 5,139 feet (1566^m4). As regards scenery, Ternate is perhaps the finest harbour in the Republic of Indonesia, being formed by the two volcanic islands of Ternate and Tidore, which are nearly 6,000 feet (1828^m8) high. The interior of Halmahera is practically uninhabited. 20

Farther south, lie the two distinct and compact groups of Batjan and Obi.

Obi Major is the chief of the Obi group.

Zuidelijke Molukken.—Buru, despite its fertility and natural resources, is still one of the least-known islands in the Republic of Indonesia. It is mountainous, culminating near the western end in Kapalatmada, 7,967 feet (2428^m3) high, with which are connected other mountain masses gradually decreasing in height eastward, and higher and more precipitous along the southern than the northern side. In the northern part of the island the country is somewhat bare, but most of the remainder is forest clad. 30

Ceram is the largest island in the Molukken archipel, but its importance is by no means in proportion to its size. A very fine range of mountains runs in an easterly and westerly direction, which give it a grand and massive appearance. The highest of these is Binaija, 10,021 feet (3054^m4) high, and there are several other peaks exceeding 6,000 feet (1828^m8). The whole island is densely covered with forest. 35

The Ambon group consists of the main island, Ambon, and three smaller islands lying eastward of it, namely, Haruku, Saparua, and Nusa Laut, known as the Uliasers. 40

Banda eilanden, though small in extent, are important, as here the nutmeg tree grows to its greatest perfection. There are ten islands, situated about 65 miles south-westward of the south-eastern extremity of Ceram. There are only three of any importance, namely, Groot Banda, on which are most of the nutmeg parks; Naira and Gunung Api, the volcano. 45

Kai eilanden.—This group consists of Nuhu Tjut, Nuhu Rowa and Du Rowa, and a number of islets, which are situated about 120 miles east-south-eastward of the Banda eilanden and about 70 miles from the coast of New Guinea. Most of these islands are covered with magnificent forests. Nuhu Tjut is mountainous, the land rising gradually from sandy beaches on either coast towards the centre, where a ridge, with peaks between 2,000 and 3,000 feet (609^m6 and 914^m4) high, extends through the island from north to south. The remaining islands are encircled by extensive shoals and are compara- 55

tively low, the highest point of Nuhu Rowa attaining an elevation of 390 feet (118^m9).

About one-third of the inhabitants are Muhammadans and immigrants of varied nationality. The remainder appear to be a mixture
5 between the Papuan and Malay. The villages are very numerous and nearly all stand close to the coast.

Aru eilanden.—These islands, situated about 65 miles eastward of Kai eilanden and 62 miles from the coast of New Guinea, consist of five principal islands, or perhaps more accurately, one land mass intersected
10 by several narrow channels, and numerous smaller islands.

The Aru eilanden are sparsely inhabited.

Sermata eilanden.—Under this name are generally included the long chain of islands, which extend in two groups from the eastern end of Timor towards the Tanimbar eilanden, and which terminate in the
15 Babar eilanden.

The southern group is of much lower elevation than the northern; the hills are generally well-wooded, and there are some extensive plains.

Tanimbar eilanden.—This is an extensive group of islands, lying
20 at the eastern extremity of the Sermata eilanden, and only 180 miles from the north coast of Australia. The largest island of the group is Jamdena, northward and southward of which are the islands of Larat and Selaru, respectively. North-westward of these three islands is a continuous chain of off-lying islands, only two of which, Molu and
25 Seira, are of any importance.

The coast, which is much indented and fringed by reefs, is covered with coconut palms and mangroves, and bordered by precipitous coral bluffs, from 60 to 80 feet (18^m3 to 24^m4) high, on which the villages stand.

Papua or New Guinea.—This vast island is generally mountainous on its northern coast, the Arfak gebergte in the western portion, situated about 20 miles southward of Manokwari, *see* Pacific Islands Pilot, Vol I, attaining an elevation of 9,644 feet (2939^m5). The south coast eastward of Long. 135° E. is low and swampy, covered with gigantic trees,
35 and fringed in places by mudbanks which stretch seaward to a distance of 9 or 10 miles. This coast, however, is backed by the Nassau gebergte of Sneeuw gebergte, Carstensz Toppen, its highest peak, being situated nearly 60 miles inland. (*See* page 263.) Westward of the above meridian, the entire coastline, as far round as, and including,
40 Geelvink baai, *see* Pacific Islands Pilot, Vol. I, is fronted by a succession of islands, many of them of considerable size. The interior of the island is little known, but it is covered with dense forests, as is also the greater part of the coast.

Populations.—The populations of the Republic of Indonesia and
45 Netherlands New Guinea was estimated, in 1955, to be 80,000,000 and 775,000 respectively.

The population of Portuguese Timor was 442,378 in 1950.

Language.—The official language of the Republic of Indonesia is *Bahasa Indonesia* which is understood in the whole country; in
50 addition some 25 main languages are spoken, of which Javanese, Sundanese and Madurese are the most important.

The Malay language is generally understood throughout Netherlands New Guinea and is in universal use by the natives.

Currency.—The monetary unit is, in the Republic of Indonesia, the
55 rupiah, in Netherlands New Guinea, the guilder or florin, as in the Netherlands, and in Portuguese Timor, the escudo as in Portugal.

Weights and measures.—The metric system is in use in Netherlands New Guinea and the Republic of Indonesia.

The following are the old weights and measures:—

1 Picul	= 136.16 lbs.	avoirdupois	
1 Katti	= 1.36	"	5
1 Tjengkal	= 4	yards	
1 Square paal	= 227	hectares	= 561.56 acres
1 Bouw	= 1.7536	acres	
1 Paal (Java)	= 1,506	metres	
1 Paal (Sumatra)	= 1,852	metres	10

Trade.—In 1952 the Indonesian ports had a turnover of 4,151,249 gross tons of imports and 8,851,341 gross tons of exports. The chief export is oil.

In Netherlands New Guinea the exports consist mainly of oil and forest produce. 15

In Portuguese Timor the chief exports are sandal wood, coffee and copra.

Communications.—Sea communication in the archipelago is maintained by the Indonesian merchant fleet which, in 1952, comprised 131 vessels of 203,000 tons gross. 20

There is occasional communication by sea between Portuguese Timor and Portugal and also with Darwin in Australia.

Air communication in Indonesia is operated by the government and the country is served by various international services.

Radio stations.—The following coastal radio stations in the area 25 covered by this volume are open for public correspondence:—

Ambon (Amboina in List), Menado, and Doom. For details see List published by the General Secretariat of the International Telecommunication Union.

Telegraph and telephone services.—The ports, principal towns, 30 and many of the villages of any importance within the area described in this volume, are connected to the general telegraphic and telephonic services.

Fuel.—Fuel oil can be obtained at Ambon, Bula, Menado and Ternate. 35

Coal can be obtained at Ambon.

Repairs.—Repairs to small vessels can be carried out at Sorong-Doom.

Deratisation.—In accordance with Article 17 of the International Sanitary Regulations, Deratisation can be carried out, and certificates 40 of Deratisation can be issued, but certificates of exemption from Deratisation are not issued, at Menado, the only port affected within the area covered by this volume.

Standard and Summer Times.—All information regarding Standard Times and Summer Times will be found in the Admiralty 45 List of Radio Signals, Vol. V.

PILOTAGE.—Pilotage is compulsory for all the ports in Netherlands New Guinea and the Republic of Indonesia at which pilots are available. Pilotage signals for the various harbours and coasts in Netherlands New Guinea and the Republic of Indonesia, which apply also to light-vessels 50 equipped to show signals connected with the pilot service, are a given hereafter. The term "by day" indicates between sunrise and sunset, and "at night" indicates the remainder of the 24 hours.

Pilot signals.—The following signals are to be made by vessels entering and requiring a pilot:—

- By day: (a) The National flag, surrounded by a white border one-fifth the breadth of the flag, hoisted at the foremast head.
- 5 or (b) The pilot signal, "P.T." of the International Code of Signals.
- or (c) Flag "G" of the International Code of Signals.
- or (d) The distant signal, consisting of a cone point upwards, having above it two balls or shapes resembling balls.
- 10 At night: (a) A *blue* light every fifteen minutes.
- (b) A bright *white* light, flashed or shown at short intervals, just above the bulwarks, for about one minute at a time.
- 15 (c) The signal "P.T." in the Morse code made by flashing lamp.

The above signals must be shown until the pilot is on board, or until an answering signal has been shown.

- 20 Vessels arriving at night, but not wishing to enter at night, shall show the pilot signal at daybreak.

Answering signals by pilot light-vessels.—The following answering signals are given by pilot light-vessels to entering vessels giving the pilot signal:—

25	Day signal.	Night signal.	Signification.
Nil.		White flare or swinging a <i>white</i> light.	The pilot will proceed to the vessel at once.
30	Flag "D" of the International Code of Signals or a cone, point upwards, surmounted by a ball.	A <i>red</i> light above a <i>white</i> light.	No pilot is available on board the pilot lightship; the vessel may enter without a pilot until one is met.

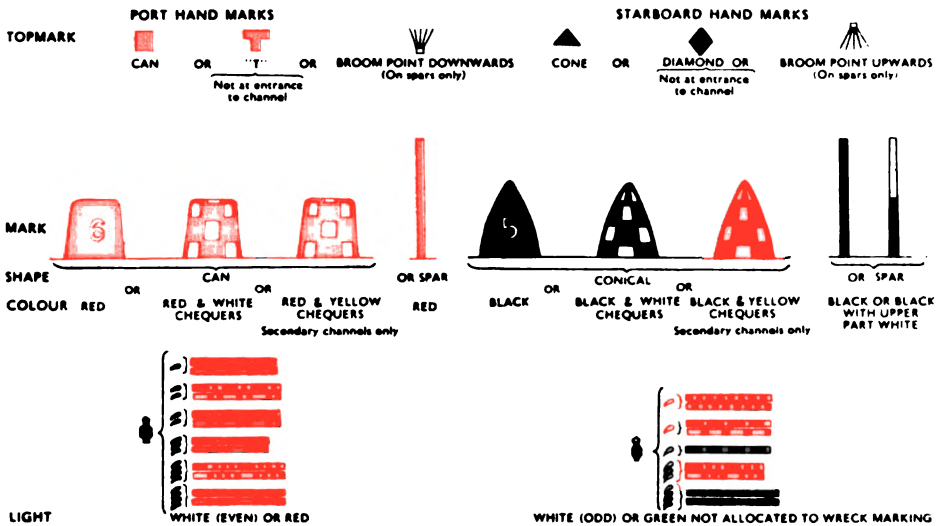
- 35 **BUOYAGE.**—The coloured diagrams facing pages 6 and 7 illustrate the Uniform System of Buoyage as agreed at the International Conferences convened at London in 1933 and 1936. This system, with minor differences fully described below, is being adopted gradually in the waters of the Republic of Indonesia and Netherlands New Guinea, but some time may elapse before the change-over from the old system is completed in all areas. *Mariners are cautioned that both the old and the new systems may be met with for some time to come.* Admiralty publications are being amended as information is received. The body of this volume, together with the appropriate large scale chart and latest Notice to Mariners, should invariably be consulted for all details of buoyage at particular places.

Netherlands New Guinea.—Uniform System.—The following is a description of the new uniform system as it is being applied in Netherlands New Guinea. It will be noticed that the system differs in some respects from that illustrated in the diagrams; the latter are intended as pictorial aids only and should not be used without reference to the article hereunder.

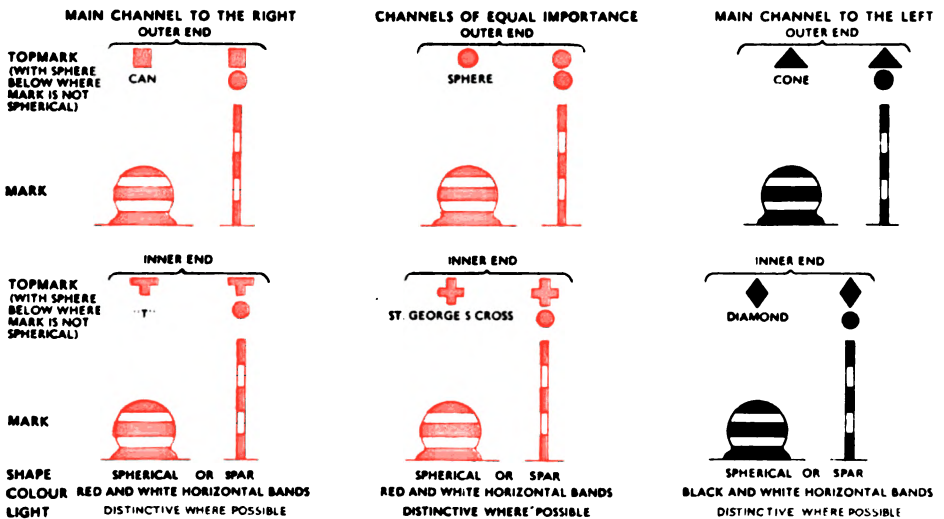
Caution.—For the time being, all light-buoys in the Lateral system are or the same shape, their purpose being indicated by the colour of the buoy and its light characteristics only.

DIAGRAMS ILLUSTRATING THE UNIFORM SYSTEM OF BUOYAGE

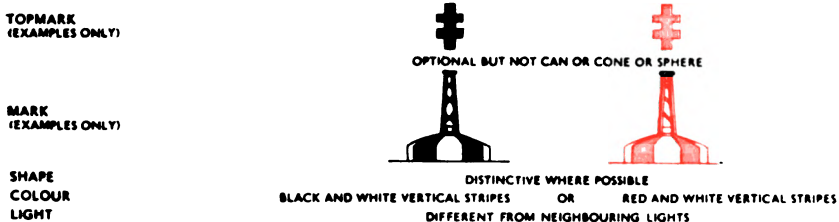
LATERAL SYSTEM



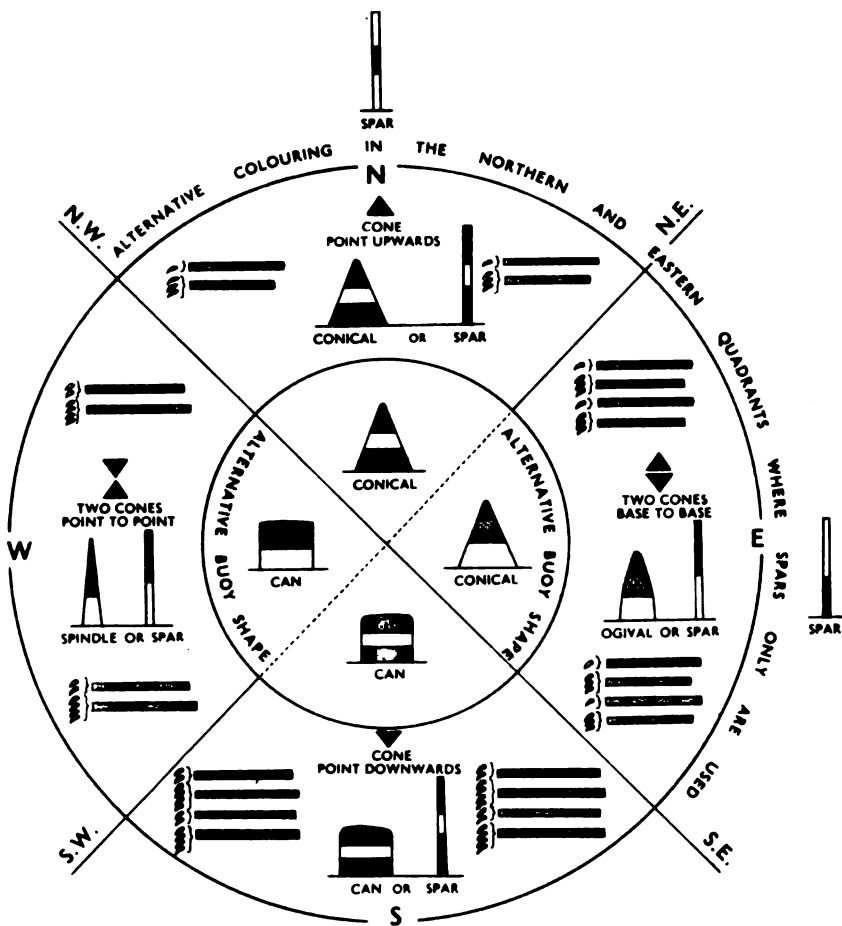
MIDDLE-GROUND OR BIFURCATION OR JUNCTION MARKS



MID-CHANNEL MARKS



DIAGRAMS ILLUSTRATING THE UNIFORM SYSTEM OF BUOYAGE CARDINAL SYSTEM



NOTE. SLIGHT MODIFICATIONS IN MINOR DETAILS TO THE ABOVE
HAVE BEEN INTRODUCED BY CERTAIN COUNTRIES

DIAGRAMS ILLUSTRATING THE UNIFORM SYSTEM OF BUOYAGE

MARKS COMMON TO BOTH SYSTEMS

AND OTHER MARKS

ISOLATED DANGER MARKS

TOPMARK



MARK



SHAPE

COLOUR WIDE BLACK AND RED HORIZONTAL BANDS

LIGHT

SEPARATED IF DESIRABLE BY A NARROW WHITE BAND

FLASHING (WHITE OR RED)

FAIRWAY MARKS



BLACK AND WHITE VERTICAL STRIPES OR RED AND WHITE VERTICAL STRIPES

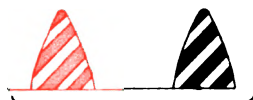
FLASHING

TRANSITION MARKS

TOPMARK



MARK



SHAPE

COLOUR

RED AND WHITE DIAGONAL STRIPES OR BLACK AND WHITE DIAGONAL STRIPES

QUARANTINE-GROUND MARKS



OPTIONAL (SEE FOOTNOTE)

YELLOW

OUTFALL AND SPOIL-GROUND MARKS

MARK



SHAPE

COLOUR

OPTIONAL (SEE FOOTNOTE)
YELLOW ABOVE AND BLACK BELOW

AREAS USED FOR NAVAL
MILITARY, OR AIR FORCE
PRACTICE PURPOSES



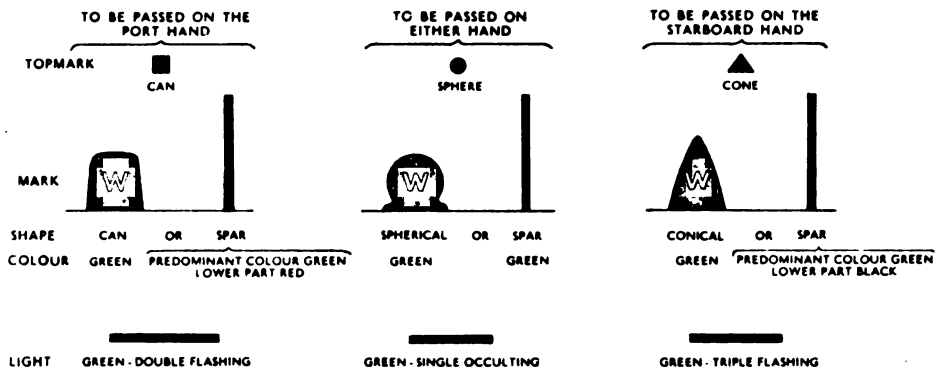
OPTIONAL (SEE FOOTNOTE)
WHITE WITH BLUE CROSS

FOOTNOTE. SHAPE IS OPTIONAL AND THE ILLUSTRATIONS ARE TO BE REGARDED AS EXAMPLES ONLY
THE ONLY DEFINITE REQUIREMENT IS THAT THE SHAPE ADOPTED SHALL NOT BE MISLEADING

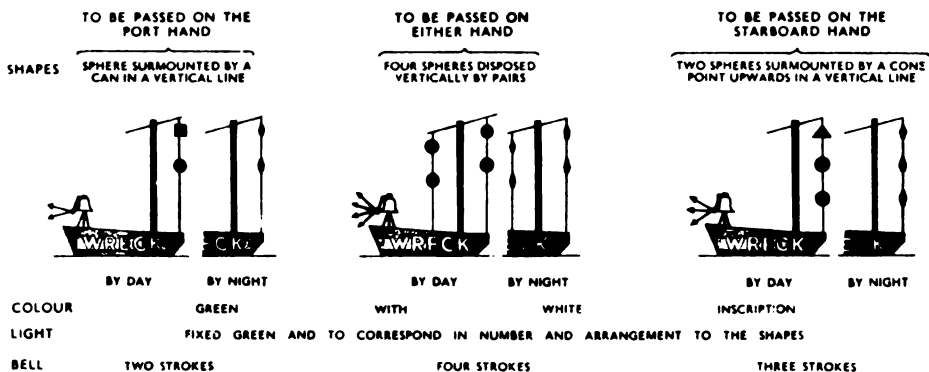
DIAGRAMS ILLUSTRATING THE UNIFORM SYSTEM OF BUOYAGE

MARKING OF WRECKS

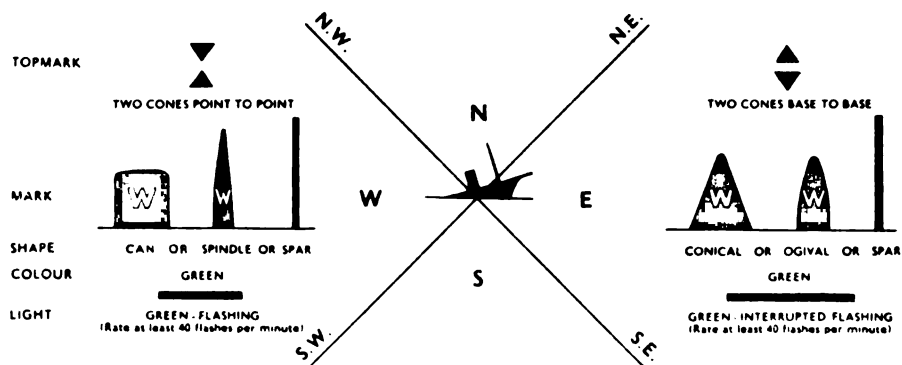
LATERAL SYSTEM BUOYS



VESSELS



CARDINAL SYSTEM



C. B. H. 26575

C. B. H. 20796 - Wt. 28450 - Dd. H. 0258 - 25000 - 1/52
21959 - 21214 - H. 0254 - 120000 - 9/52

Transition marks.—There are two uniform systems of buoyage in use or coming into use, the “ Lateral ” system and the “ Cardinal ” system. They may be used simultaneously and, if so used, the transition from one system to the other is indicated by a mark painted red and white or black and white in diagonal stripes, with or without a topmark consisting of a cross having two horizontal bars, painted red or black. In cases where no doubt is possible, transition may be indicated by topmarks as described above added to the limiting marks of the two systems. The topmark shown on the diagram is to be disregarded. Transition buoys, if lighted, will exhibit either *white* or *red* lights. 10

Lateral system.—This system is generally used for marking well-defined fairways. The term “ starboard-hand ” denotes that side which would be on the right hand of the mariner wither going with the main flood tidal stream or approaching or entering a harbour, river or estuary from seaward. 15

The term “ port-hand ” denotes the left hand of the mariner in the same circumstances.

Starboard-hand buoys are conical and are painted black or black and white in chequers, or, in secondary channels, black and yellow in chequers. 20

Starboard-hand topmarks, if any, consist of black cones, points up, or for purposes of differentiation, except at the entrance to a channel, of black diamonds.

Lights on starboard-hand buoys, if any, are *white occulting* and not as shown on the diagram. *Green* lights are not used on starboard-hand marks in Netherlands New Guinea waters. 25

Light-structures in close proximity to the starboard side of the channel, are painted black or in black and white horizontal bands.

In addition to the above, the starboard side of a channel may be marked by spar buoys, perches, floating beacons or stakes. Spar buoys are painted black or black and white and may or may not carry a topmark as described above; perches and floating beacons are painted black and carry a topmark consisting of two black cones, points up; stakes are unpainted, but carry a daymark consisting of tree-branches closely bound together to resemble a down-turned broom. The topmark shown above the spar buoys in the diagram is to be disregarded. 30 35

Port-hand buoys are can shaped and are painted red or red and white in chequers, or, in secondary channels, red and yellow in chequers.

Port-hand topmarks, if any, consist of red cylinders, or for purposes of differentiation, except at the entrance to a channel, of red T's. 40

Lights on port-hand buoys, if any, are *red occulting* and not as shown on the diagram. *White* lights are not used on port-hand marks in Netherlands New Guinea waters.

Light-structures in close proximity to the port side of a channel are painted red or in red and white horizontal bands. 45

In addition to the above, the port side of a channel may be marked by spar buoys, perches, floating beacons or stakes. Spar buoys are painted red or red and white and may or may not carry a topmark as described above; perches and floating beacons are painted red and carry a red cylindrical topmark; stakes are unpainted but carry a daymark consisting of tree-branches which are left unbound. The topmark shown above the spar buoy in the diagram is to be disregarded. 50

Buoys marking middle grounds which have channels on either side of them, are spherical and painted in either red and white or black and white horizontal bands; such buoys may be left on either hand, with due caution as to the position of the buoy in relation to the shoal which 55

it marks. In regard to the colouring of these buoys and the topmarks carried, the following rules are observed:—When the main or preferred branch of the channel lies to port of the buoy as seen from seaward, its colour will be black and white and its topmark, if any, a single
 5 black cone, point up; the inner end of such a middle ground is marked by a similar buoy, but carrying a black diamond topmark; in order to follow the main or preferred branch of the channel, these buoys must be left on the starboard hand when proceeding inwards. When the main or preferred branch of the channel lies to starboard of the buoy as
 10 seen from seaward, its colour will be red and white and its topmark, if any, a red cylinder; the inner end of such a middle ground is marked by a similar buoy but carrying a topmark in the shape of a red T; in order to follow the main or preferred branch of the channel, these buoys must be left on the port hand when proceeding inwards.

15 When the branches of the channel on either side of the buoy are of equal importance, its colour will be red and white and its topmark, if any, a red ball; the inner end of such a middle ground is marked by a similar buoy but carrying a topmark in the shape of a red S. George's cross.

20 Light-buoys may be used to mark middle grounds, and in this case the following rules are observed:—Buoys painted in black and white horizontal bands exhibit *white occulting* lights and those painted in red and white horizontal bands, either *red occulting* lights or *white flashing* lights having an *even* number of flashes.

25 In addition to the above, middle grounds may also be marked with spar-buoys or floating beacons. The rules for colouring are the same as for spherical buoys, but in the case of the topmark, in order to make it more distinctive, a ball is placed under the characteristic shape (*see* diagram). This form of double topmark is also occasionally used on
 30 spherical buoys.

Mid-channel buoys are of a distinctive shape different from the principal characteristic shapes (conical, can and spherical). They are painted in vertical stripes, either black and white or red and white.

Mid-channel topmarks, if any, are of a distinctive shape other than a
 35 cone, cylinder or ball.

Lights on mid-channel buoys, if any, are *white* or *red* and are different from the neighbouring lights at the sides of the channel.

Isolated danger buoys are spherical and are painted black and red in wide horizontal bands separated by a narrow white band. Isolated
 40 danger topmarks, if any, consist of one or two balls, painted black or red or half black and half red horizontally.

Lights on isolated danger buoys, if any, are *white* or *red* but not necessarily flashing as stated on the diagram.

Landfall buoys (Fairway marks in the diagram), which serve to
 45 indicate the seaward approach to a harbour, river or estuary are usually similar in shape and colour to mid-channel buoys, *see* above. The topmark on these buoys is a "S. Andrew's cross", painted either black or red.

Lights on landfall buoys, if any, are *white*. The characteristics is not defined.

50 *Note.*—Buoys on the same side of channel, estuary or tideway have the initial letter of the name of the channel painted on them in white followed by a number; numbering of buoys always starts from seaward starboard-hand buoys carry *odd* numbers and port-hand buoys *even* numbers. Buoys marking middle grounds are not numbered but are
 55 marked with the initial letters of the names of both channels, that of the main or preferred branch being mentioned first.

Cardinal system.—This system is used in outer areas and along coasts which are fringed with reefs or isolated dangers. The marks vary in character according to the quadrant of the true compass in which they are situated, with reference to the danger which they mark.

For this purpose the true compass card is divided into four quadrants, called North, East, South and West, which are bounded by the bearings north-east, south-east, south-west, and north-west from the danger. The quadrant in which the mark lies can be identified by the characteristics of the mark as follows:—

North quadrant.—The buoys are conical, painted black with a broad, white horizontal band in the middle, and may be surmounted by two cones, points up, but not by a single cone as shown in the diagram. 10

Lights, if any, are *white flashing* exhibiting an *odd* number of flashes. The occulting lights shown on the diagram are to be disregarded.

East quadrant.—The buoys are conical, painted, the upper part, red and the lower part, white, and may be surmounted by two cones, bases together. The ogival-shaped buoys, shown on the diagram, are not used in these waters. 15

Lights, if any, are *red flashing* exhibiting an *odd* number of flashes. The white lights and red occulting lights shown in the diagram are to be disregarded. 20

South quadrant.—The buoys are can-shaped, painted red with a broad, white horizontal band in the middle, and may be surmounted by two cones, points down, but not by a single cone as shown on the diagram. 25

Lights, if any, are *red flashing* exhibiting an *even* number of flashes. The white lights and red occulting lights shown on the diagram are to be disregarded.

West quadrant.—The buoys are can shaped, painted, the upper part, black and the lower part, white, and may be surmounted by two cones, points together. The spindle-shaped buoys, shown on the diagram are not used in these waters. 30

Lights, if any, are *white flashing* exhibiting an *even* number of flashes. The white occulting lights shown on the diagram are to be disregarded.

Note.—Spar buoys may be used in all quadrants in lieu of buoys of the principal characteristic shapes; in this case, the quadrant in which the buoy lies is indicated by its colour and topmark, if one is carried, only. 35

Cardinal system buoyage will be marked with the name or the initial letters of the name of the relative bank or danger which it marks. 40

Wreck-marking.—Wrecks may be marked either by the Lateral or the Cardinal system.

Green is the colour used for all purposes connected with wreck-marking, *viz* :—For vessels, buoys, daymarks, lights, etc., vessels and buoys have the initial letter of the word meaning wreck in the language of the country under whose authority they lie, or the name of the wreck they mark, in full, painted on them in white letters. 45

Lateral system.—*Wreck-marking buoys* which are:—

(a) To be passed on the mariner's port hand:—

A can shaped buoy, and, if lighted, exhibiting a *green group flashing* light showing groups of *two* flashes. The topmark, if any, is a cylinder. 50

(b) To be passed on the mariner's starboard hand:—

A conical buoy, and, if lighted, exhibiting a *green group flashing* light showing groups of *three* flashes. The topmark, if any, consists of a single cone, point up, or two cones, points up. 55

(c) To be passed on either side:—

A spherical buoy, and, if lighted, exhibiting a *green occulting* light. The topmark, if any, consists of one or two balls.

Note.—Spar buoys and floating beacons, when used, are painted all green and not as shown in the diagram. In the case of floating 5 beacons, the purpose of the beacon is indicated by the topmark carried (*see* above) and in the case of spar buoys, the purpose of the buoy is indicated by its shape, thus:—Port-hand spar buoys have square tops and starboard-hand spar buoys, pointed tops.

Wreck-marking vessels.:—

10 I. Lights, exhibited between sunset and sunrise:—

(a) To be passed on the mariner's port hand:—

Two *fixed green* lights, disposed vertically above the hull.

(b) To be passed on the mariner's starboard hand:—

Three *fixed green* lights, disposed vertically above the hull.

15 (c) To be passed on either side:—

Four *fixed green* lights placed in pairs, one pair on each yardarm; the lights of each pair being disposed vertically above the hull.

Note.—The ordinary riding light for a vessel at anchor is not 20 exhibited.

II. Shapes:—Between sunrise and sunset green balls or shapes corresponding in number and arrangement to the *green* lights. *See* diagram.

25 III. Fog signal, rung on a deep-toned bell at intervals of not more than 30 seconds.

(a) to be passed on the mariner's port hand—2 strokes in succession.

(b) to be passed on the mariner's starboard hand—3 strokes in succession.

30 (c) To be passed on either side—4 strokes in succession.

Cardinal system.—Under this system, wreck-marking buoys are placed only in the East or West quadrants and have the following characteristics:—

East quadrant buoys are conical, and may be surmounted by two 35 cones, bases together.

Lights, if any, are *interrupted quick flashing green*.

West quadrant buoys are can shaped, and may be surmounted by two cones, points together.

Lights, if any, are *quick flashing green*.

40 *Note*.—Spar buoys may be used in either quadrant, their purpose being indicated by shape thus:—East quadrant spar buoys have pointed tops, and west quadrant spar buoys, square tops. These buoys may or may not carry topmarks as described above. The ogival and spindle-shaped buoys shown in the diagram are not used 45 in Netherlands New Guinea.

Miscellaneous buoys.—Buoys marking spoil grounds or sewer outfalls are not considered as navigational buoys, but, when moored in the vicinity of channels, are generally of the appropriate shape as for channel marking; they are painted horizontally, the upper half 50 yellow, and lower half, black.

Buoys marking areas used for Naval, Military or Air Force practice purposes are, when moored in the vicinity of channels, generally of the appropriate shape as for channel marking, i.e. either conical or can shaped, if lit, conical buoys will generally exhibit *white* lights, 55 and can buoys, *red* lights. These buoys are painted white with two blue vertical stripes, intersecting at the top of the buoy, thus represent-

ing a cross when seen from above; they are marked in red with the initial letters of the words " Danger Zone " or " Danger Area " in the language of the country responsible for them.

Fishing grounds may be marked by buoys painted in a similar manner to those marking practice areas. 5

Quarantine ground buoys are defined as yellow in colour and of optional shape having regard to the rules for channel marking.

Buoys intended for moorings or other purposes not included above, may be of any shape or colour according to the discretion of the authority within whose jurisdiction they are laid, but not such as 10 might lead to confusion with buoys whose purpose is defined above.

Government telegraph or telephone cables are marked by floating beacons, painted green and marked " R.T. " in white.

Reflectors may be placed on certain buoys to assist the mariner 15 using a searchlight, to see them more easily at night. These reflectors will, as a rule, be *white* on starboard hand buoys, *red* on port-hand buoys and *green* on wreck-marking buoys.

At some places, small buoys, wooden beacons, marks, etc., which are not official, may be found. These do not necessarily conform with the 20 buoyage system described above.

Republic of Indonesia.—The Lateral system which is being brought into use in Indonesian waters differs from the International Uniform System in some aspects, these differences are given below and, as with Netherlands New Guinea, the standard diagrams facing pages 25 6 and 7 do not show the Indonesian version in every case but only when the systems agree.

Spar buoys do not appear to be used, but fixed beacons are; their daymarks in channel marking may be one or two red cans on port-hand marks and one or two black cones on starboard-hand marks; 30 the broom marks shown in the diagram are to be disregarded.

Light-buoys, which for the time being are spherical in shape irrespective of the side of the channel on which they lie, if used for channel marking, will exhibit *white* or *green* lights on the starboard hand and *white* or *red* lights on the port hand. Instead of lights the fixed 35 beacons will be fitted with reflectors showing the same colours as the appropriate lights.

The ends of middle grounds are marked by spherical buoys painted in red and white horizontal bands, and by fixed beacons. *Note.*—Black and white horizontally banded buoys are not used in Indonesian 40 waters.

The buoy marking the outer end of a channel passing on either side of a bank carries no topmark, while the buoy marking the inner end has a red S. George's cross topmark.

The daymarks of the fixed beacons at the outer end of a channel are as 45 follows:—

Main or preferred channel to starboard of a bank as seen from seaward, a red and white ball, or the ball with a red can above it.

Channels of equal importance on either side of a bank, two red balls. 50

Main or preferred channel to port of a bank as seen from seaward, a black and white ball, or the ball with a black cone, point up, above it.

The daymarks at the inner end are as follows:—

Main or preferred channel to starboard of a bank as seen from seaward, 55 a red T over a red and white ball.

Channels of equal importance on either side of a bank a red S. George's cross over a red ball.

Main or preferred channel to port of a bank as seen from seaward, a black diamond over a black and white ball.

- 5 The lights of light-buoys will conform as far as possible but ought to differ from other lights in the near vicinity.

Fairway buoys are painted in vertical stripes, either black and white on the starboard side, or red and white on the port side with, occasionally, a black or red S. Andrew's cross topmark. If lighted the lights
10 ought to differ from other lights in the near vicinity.

SIGNALS.—Vessels inconvenienced by searchlights.—In the event of the navigation of a vessel being inconvenienced by the glare from searchlights near a port in the British Empire, she should make the International Code signal ZO (— . . — — —) by lamp and by
15 whistle, siren or fog horn.

Both the light and sound signals should be employed, whenever possible, and should be repeated until the inconvenience is removed.

- 20 Only real urgency should necessitate the use of this signal as, unless the vessel is actually in the rays of a searchlight, it is not possible for the operators to know which projector is affected.

This signal is designed to assist mariners; no liability whatever will be admitted.

- 25 This signal should also be used in similar circumstances near ports in other countries.

Light-vessels out of station.—In Netherlands New Guinea and the Republic of Indonesia, when a light-vessel is driven from her proper position the following signals will be shown :—The usual light will not be exhibited, but a *red fixed* light will be exhibited at each
30 end of the vessel, and a *red* and a *white* flare will be shown simultaneously at least every quarter of an hour; if the use of flares is impracticable a *red* light and a *white* light will be shown simultaneously. By day, the distinguishing daymark will be struck if practicable, a black ball will be shown at each end of the light-vessel,
35 and the International Code signal PC will be displayed.

Surveying vessels.—Vessels of the Indonesian Government employed on surveying duties show the signals prescribed in the International Regulations for the Prevention of Collision at Sea for a vessel employed in laying or lifting submarine cables.

- 40 **Signal to denote the presence of submarines.**—Netherlands vessels, which are carrying out exercises with submarines, or are escorting submerged submarines, display a red flag at the masthead.

All vessels must give a vessel, which is displaying a red flag at the
45 masthead, a wide berth.

A vessel, which, for some reason, finds it necessary to approach the vessel displaying a red flag, must proceed at slow speed until the latter vessel has indicated the danger zone by means of flags, or other signals, or megaphone.

- 50 In every case, in these circumstances, a good look out must be kept for submarines, which may have only the periscope above water.

General communication signals.—The following flag signals may be used in the harbours of Netherlands New Guinea and the Republic of Indonesia, in addition to those laid down in the Inter-
55 national Code of Signals:—

A.—Displayed on shore.—

3	Pendant	A	Your berth is Pier	I.
"	"	B	" " " "	II.
"	"	C	" " " "	III.
"	"	D	" " " "	IV.
"	"	E	" " " "	V.
"	"	F	" " " "	VI.
"	"	G	" " " "	VII.
"	"	R	You must anchor in the road.	

5

Note.—When two or more vessels are entering a harbour at the same time, the berthing signal for one particular vessel can be indicated by hoisting the company or national flag of that vessel below the signal.

Blue flag. No communication owing to bad weather.

B.—Displayed on board.—

1	Pendant	H	I need dock assistance.	15
2	"	M	Please send a motor boat.	
3	"	J	Water flag.	
1	"	N	I have passengers from outside Netherlands New Guinea or the Republic of Indonesia who wish to disembark.	20
2	"	V	I require an ash-boat.	

3	"	Q	I have, in my opinion, one or more cases of an infectious nature on board, or taken on board during the voyage.	25
At night, a red light above a white light, 6 feet (1m8) apart.				

Flag B of the International Code of Signals (I am loading or discharging inflammable material or explosives) can also be used to denote "I am loading or discharging light inflammable material." 30

Vessels requiring the Company's doctor can display their Company's flag above flag W of the International Code of Signals.

REGULATIONS.—Manoeuvres or other causes may necessitate the closing of the various zeegats and harbours in Netherlands New Guinea and the Republic of Indonesia, or may make the entry thereto subject to special reservations. 35

In normal cases the following signals will be shown from a flag-staff in the harbour area and/or from a lookout station, or may be shown from the pilot light-vessels:—

Day Signal.	Night Signal.	Signification.	40
A black cone, point up, between two black balls.	A white light between two red lights.	Entering prohibited.	
A black ball below two black cones, point together.	A white light, with a green light above it and a red light below it.	Entering and leaving prohibited.	45
A black cone, point down, below two black cones, points together.	A white light between two green lights.	Leaving prohibited.	50

All the above shapes and lights are disposed vertically.

In exceptional circumstances, three red balls or three red lights, disposed vertically, denotes that vessels are absolutely prohibited from entering, except in most urgent cases. When this signal is seen 55

by a vessel approaching she must proceed—wind and sea permitting—to the examination vessel, which displays the same signal, stationed at the entrance to the zeegat.

Permission or refusal to enter will be given after examination. A vessel is then only allowed to enter provided she is in charge of a pilot, or is preceded by a warship or a pilot vessel; from the moment the signals are shown all exemptions from taking a pilot cease. Captains and masters of vessels are to carry out the instructions of the officer who has come on board from the examination vessel and are to obey all signals.

If a warning shot is fired, the engines of all vessels in the vicinity of the examination vessel must be stopped immediately, in so far as safety permits. Failure to comply with these regulations may result in danger to the vessel and crew. As a general rule permission to enter at night will not be granted.

If a signal is made from the shore to intimate that vessels are subject to examination, and if there is no examination vessel in the entrance to the zeegat, vessels must anchor or lie off.

The coming into operation of these regulations at any particular zeegat or harbour will not be announced beforehand.

LIFE-SAVING.—Lifeboats and Life-saving appliances form the principal means adopted for saving life.

The line-throwing apparatus, the principal life-saving appliance, can often be used with effect when a lifeboat is not available; its success, however, depends largely upon an intelligent co-operation on the part of the crew of the stranded vessel.

Signals.—In accordance with the International Convention for the Safety of Life at Sea, 1948, Chapter V, Regulation 16, the following signals shall be used by life-saving stations when communicating with ships in distress and by ships in distress when communicating with life-saving stations:—

(a) *Replies from shore stations to distress signals made by a ship:—*

<i>Signal.</i>	<i>Signification</i>
<i>By day.</i> —White smoke signal.	} “ You are seen—assistance will be given as soon as possible.”
35 <i>By night.</i> —White star rocket.	

(b) *Landing signals for the guidance of small boats bringing away the crew of a wrecked ship:—*

<i>Signal</i>	<i>Signification</i>
40 (i) <i>By day.</i> —Vertical motion of a white flag or the arms. <i>By night.</i> —Vertical motion of a white light or flare. A range (indication of direction) may be given by placing a steady white light or flare lower and in line with the observer.	} “ This is the best place to land.”
50 (ii) <i>By day.</i> —Horizontal motion of a white flag or arms extended horizontally. <i>By night.</i> —Horizontal motion of a white light or flare.	} “ Landing here highly dangerous.”

(b) *Landing signals for the guidance of small boats bringing away the crew of a wrecked ship:—continued*

Signal	Signification	
(iii) <i>By day.</i> —Horizontal motion of a white flag, followed by the placing of the white flag in the ground and the carrying of another white flag in the direction to be indicated.	"Landing here highly dangerous. A more favourable location to land is in the direction indicated."	5
<i>By night.</i> —Horizontal motion of a white light or flare, followed by the placing of the white light or flare on the ground and the carrying of another white light or flare in the direction to be indicated.		10

(c) *Signals to be employed in connection with the use of shore life-saving apparatus:—*

Signal	Signification	
(i) <i>By day.</i> —Vertical motion of a white flag or the arms. <i>By night.</i> —Vertical motion of a white light or flare.	<i>In general</i> —"Affirmative."	20
	<i>Specifically:—</i>	
	"Rocket line is held."	
	"Tail block is made fast."	
	"Hawser is made fast."	
(ii) <i>By day.</i> —Horizontal motion of a white flag or arms extended horizontally. <i>By night.</i> —Horizontal motion of a white light or flare.	"Man is in the breeches buoy."	25
	"Haul away."	
	<i>In general</i> —"Negative."	
	<i>Specifically:—</i>	
	"Slack away."	30
	"Avast hauling."	

SUBMARINE CABLES.—The following Articles are taken from the International Convention for the protection of Submarine Telegraph cables, of 14th March, 1884.

II. It is a punishable offence to break or injure a submarine cable, wilfully or by culpable negligence, in such manner as might interrupt or obstruct telegraphic communication, either wholly or partially, such punishment being without prejudice to any civil action for damages.

This provision does not apply to cases where those who break or injure a cable do so with the lawful object of saving their lives or their ship, after they have taken every necessary precaution to avoid so breaking or injuring the cable.

V. Vessels engaged in laying or repairing submarine cables shall conform to the regulations as to signals which have been, or may be, adopted by mutual agreement among the High Contracting Parties, with a view of preventing collisions at sea.

When a ship engaged in repairing a cable exhibits the said signals, other vessels which see them, or are able to see them, shall withdraw to or keep beyond a distance of one nautical mile at least from the ship in question, so as not to interfere with her operations.

Fishing gear and nets shall be kept at the same distance.

Nevertheless, fishing-vessels which see, or are able to see, a telegraph-ship exhibiting the said signals, shall be allowed a period of twenty-four hours at most within which to obey the notice so given, during which time they shall not be interfered with in any way.

The operations of the telegraph-ships shall be completed as quickly as possible.

VI. Vessels which see, or are able to see, the buoys showing the position of a cable when the latter is being laid, is out of order, or is broken, shall keep beyond a distance of one-quarter of a nautical mile at least from the said buoys.

Fishing nets and gear shall be kept at the same distance.

VII. Owners of ships or vessels who can prove that they have sacrificed an anchor, a net, or other fishing gear in order to avoid injuring a submarine cable, shall receive compensation from the owner of the cable.

In order to establish a claim to such compensation, a statement supported by the evidence of the crew, should, whenever possible, be drawn immediately after the occurrence; and the master must, within twenty-four hours after his return to or next putting into port, make a declaration to the proper authorities.

The latter shall communicate the information to the Consular authorities of the country to which the owner of the cable belongs.

Caution.—Cautionary notes appear on many charts, calling attention to areas in which there are submarine telegraph cables; these areas are indicated on the charts by pecked lines.

Every care should be taken to avoid anchoring in such areas, even though there may be no specific prohibition against doing so, in view of the serious interference with communications which results from damage to submarine cables.

Equal care should be taken wherever the symbol for a submarine cable (a wavy line) is shown on the chart.

Danger involved in cutting a submarine cable to clear anchors or fishing gear.—In the event of any vessel fouling a submarine cable, every effort should be made to clear the anchor or gear by normal methods; should these efforts fail, the anchor or gear should be slipped and abandoned *without attempting to cut the cable. High voltages are, or may be, fed into certain submarine cables; serious risk exists of loss of life due to electric shock, or at least of severe burns if any attempt to cut the cable is made.* No claim in respect to injury or damage sustained through such interference with a submarine cable will be entertained.

Compensation for anchors or fishing gear sacrificed in order to avoid injuring a submarine cable can be claimed under the Submarine Telegraph Act of 1885 (Schedule of Submarine Telegraph Convention, Article VII).

Chart 1044.

OCEANIC BANKS AND SHOALS.—The following banks and shoals, situated between the meridians 128° and 137° E. and in the vicinity of the parallel 10° S., lie in the tracks of vessels passing through the Arafura sea; it is probable that other banks and shoals exist near this parallel.

Most of these banks and shoals lie within the area embraced by Australia Pilot, Vol. V to which reference should be made, but descriptions of them are also given below and in the body of the book.

Other outlying banks and shoals which are neither oceanic nor in the tracks of vessels are described in their appropriate places in the book.

Troubadour, a shoal, with a least depth of 9 fathoms (16^m5) over it, lies in approximately Lat. 9° 44' S., Long. 128° 28' E.

Chart 1044.

A bank, with a least depth of 12 fathoms (21^m9) over it, lies about 13 miles south-eastward of Troubadour.

A bank, with a least depth of 10 fathoms (18^m3) over it, lies about 34 miles eastward of Troubadour. 5

Flinders and Franklin shoals, each with a least depth of 5 fathoms (9^m1) over it, lie about 50 miles east-south-eastward of Troubadour.

Blackwood shoal, with a least depth of 7 fathoms (12^m8) over it, lies about 6 miles eastward of Franklin shoal.

Evans shoal, with a least depth of 5 fathoms (9^m1) over it, lies 10 about 8 miles eastward of Blackwood shoal.

Lynedock shoal, with a least depth of 6 fathoms (11^m8) over it, lies in approximately Lat. 10° 02' S., Long. 130° 49' E.

Money shoal, with a least depth of 3 fathoms (5^m5) over it, lies in approximately Lat. 10° 21' S., Long. 132° 45' E. 15

Chart 3246.

Le Cher bank, with a least depth of 13 fathoms (23^m8) over it, lies about 80 miles westward of Kaap Valsch in approximately lat. 8° 27' S., long. 136° 16' E.

A shoal area, unexamined in 1938, with a least charted depth of 20 33 feet (10^m1) over it, lies about 36 miles westward of the shoalest part of Le Cher bank, and a shoal area, unexamined in 1945, lies about 70 miles further westward in approximately Lat. 8° 30' S., Long. 134° 25' E.

Duddell shoal, with a least depth of 5 fathoms (9^m1) over it, was 25 reported in 1949, to lie in approximately Lat. 9° 58' S., Long. 136° 00' E.

Volsella shoal, with a least depth of 3 fathoms (5^m5) over it, lies about 14 miles east-north-eastward of Duddell shoal, its position is, however, approximate. 30

TIDAL STREAMS.—As large portions of the area described in this volume have as yet been imperfectly surveyed, little information regarding tidal streams is available. In the open waters the tidal streams are not strong, and merely increase or reduce the rate of the currents due to the monsoon. In contracted passages, however, they 35 may attain a considerable rate, details of which will be found in the body of the work.

CURRENTS.—The currents in the Molukka, Ceram and Banda seas flow in accordance with the monsoons. As in other monsoon areas, the currents experienced are variable, with some predominance 40 of current in the direction produced by the monsoon wind.

There is some change in the direction of the monsoon wind within the small area covered by this volume. The monsoon of the northern winter is northerly in the northern part of the Molukka sea, becoming north-north-westerly in the southern part of that sea and north-westerly to west-north-westerly in the Banda sea. The monsoon of 45 the northern summer is south-easterly in the Banda sea and southerly in the Molukka sea. These monsoons are referred to below as the northerly and southerly monsoons, by which names they are generally known in this region.

The predominant flow of current produced by either monsoon there- 50 fore changes its direction accordingly. During the northerly monsoon the predominant current is southerly in the northern part of the Molukka sea and easterly in the Banda sea; during the southern

monsoon it is westerly in the Banda sea and northerly in the northern part of the Molukka sea. Islands and island groups of varying sizes, however, obstruct the free passage of the current, and near and between the islands there are likely to be local diversions of current, with
5 countercurrents in some cases. One such countercurrent, along the north coast of Ceram, is referred to on page 137.

The variability of monsoon currents is connected with variations in the strength of the monsoons and their cessation at times with replacement by winds from another direction. The current does not
10 always set in accordance with the wind blowing at the time or even that lately prevailing. As an example, in March, 1934, a west-north-westerly set, with a rate of $1\frac{1}{2}$ knots, was experienced by H.M.S. *Perseus* between Straat Manipa and the Banda eilanden, although the prevailing wind had been from westward.

15 The northern part of the region described in the present volume includes part of the Celebes sea. Here the currents are not monsoonal in origin but form a part of the main circulation of the North Pacific ocean. Eastward of Halmahera, while the currents are reversed during the year in accordance with the monsoons they form part of
20 the equatorial circulation of the Pacific.

Apart from the Celebes sea, available current observations are few in number and do not adequately cover the whole region at any time of the year. It is therefore only possible to describe the currents of the more open parts of the seas in general terms. A few remarks on
25 local currents will be found at the appropriate places in the body of the work.

Celebes sea.—In March to November the branch of the North Equatorial current of the Pacific ocean which sets southward off the east coast of Mindanao passes south-westward into the Celebes sea.
30 This results in a counterclockwise flow round the sea, with an east-going current along the north coast of Celebes. The emerging water turns north-eastward to form the beginning of the Equatorial countercurrent in Longs. 128° E. to 130° E. The circulation in the Celebes sea during these months is therefore a part of the main circulation
35 of the North Pacific ocean.

In December to February the bulk of the south-going current east of Mindanao turns south-eastward and directly forms the beginning of the countercurrent. Part of the water, however, enters the Celebes sea. Off the east coast of Borneo and north coast of Celebes the water
40 flows round in a counterclockwise direction and emerges to contribute to the countercurrent, but the bulk of this circulation, in December to February, is derived from the Sulu sea, from which the water enters through the Sibutu and other passages.

The currents of the Celebes sea are relatively strong and about half
45 the currents observed have rates of between one and 2 knots. During all the year, but mainly in December to May, currents with rates of between 2 and 3 knots may occur at times.

Throughout the year, some water branches off from the Celebes sea circulation to flow south-westward into Macassar strait, and thence
50 into the Java sea.

Molukka sea.—The currents are variable, but sets between north and north-east predominate during the southerly monsoon, from May to October. During the northerly monsoon, from December to March, southerly sets predominate. In the southerly part of the sea the
55 main flow becomes south-eastward towards and through the passage between the Sula eilanden and Obi Major, where it joins the easterly

current of the Ceram sea at this season. Some water, however, probably passes through Greyhound strait, between Banggai archipel and Sula eilanden.

It is stated that, in the northern part of the sea, the currents of either monsoon are stronger to the westward of Maju and Tifore eilanden than to the eastward of these islands. There is some evidence, however, to suggest that still further west, closely off the coast of the north-eastern end of Celebes, the current is predominantly northward during the northerly monsoon and therefore all the year.

During both monsoons the maximum rate of currents in this sea is about 2 knots.

The northerly current of the southerly monsoon, after emerging from the Molukka sea, passes into the counterclockwise circulation of the Celebes sea, referred to above. The southerly current of the northerly monsoon constitutes a branch of that circulation to the south-eastward and southward, which enters the Molukka sea.

Banda and Ceram seas.—During June to August, when the southerly monsoon is strongest, there is a marked predominance of currents with westerly components, mainly setting between north-west and west, with rates up to about 2 knots. At this time a current usually sets north-westward along the coast of New Guinea with rates up to about $1\frac{1}{2}$ knots. During the rest of this monsoon period currents appear to be more variable, but there is probably some predominance of westerly sets.

During the northerly monsoon, in December to March, currents between north and east predominate in the Ceram sea and the western part of the Banda sea, with rates up to about 2 knots; occasional currents exceed this speed. Little information is available for the eastern part of the Banda sea at this season, but the currents southward of Ceram to the New Guinea coast appear to be mainly easterly. Further south, however, in the region of the Aru and Tanimbar eilanden there is some evidence that the predominant set is between south and south-west.

Halmahera sea.—In this sea and in the ocean to the eastward of it, to about Long. 132° E., lying within the limits of this volume, the current is reversed during the year. During June to November the South Equatorial current of the Pacific ocean sets along the north coast of New Guinea in a general west-north-westerly direction. Westward of about Long. 132° E. it turns north-westerly and northerly, passing the east coasts of the northern part of Halmahera and of Morotai eiland. Further north it turns north-eastward and subsequently passes into the east-going Equatorial countercurrent of the Pacific. This current has a high degree of constancy, though occasionally sets in other directions may be met. It is strong, with maximum rates exceeding 2 knots, and occasionally exceeding 3 knots, especially in June to August.

In December to February part of the water of the North Equatorial current of the Pacific passes southward along the east coast of the Philippine group southward of Luzon and passes into the Equatorial countercurrent in about Lat. 5° N., northward of Morotai eiland. A branch of this current sets south-eastward past the east coast of this island and that of the northern part of Halmahera. It subsequently runs east-south-eastward along the coast of New Guinea, to be joined by the South Equatorial current turning southward and south-eastward along this coast between Longs. 140° E. and 150° E.

Along the east coast of the northern part of Halmahera the currents, in either direction are said to set with some strength, especially off the prominent points.

In March to May the current eastward of Halmahera is more variable.

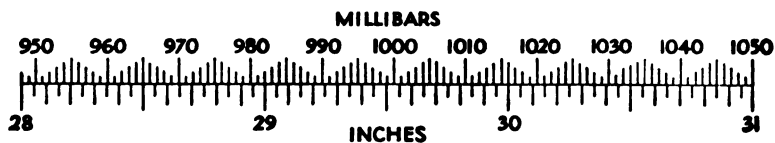
Off the southern part of the east coast of Halmahera, the currents are less well-known and are more variable. During June to November a branch of the strong current setting along the coast of New Guinea flows south-westward into the southern part of Halmahera sea; from thence it passes into the west-going monsoon current of the Ceram sea at that season. In December to February there is some evidence that the predominant set in the southern part of the Halmahera sea is reversed to east-north-eastward, passing into the east-south-eastward set along the coast of New Guinea.

CLIMATE AND WEATHER.—General remarks.—The climate is equatorial and is hot and moist; the heat is, however, alleviated by the steady breezes. The mean temperature is about 80° throughout the year with, in general, a small diurnal range. There is a seasonal change in wind direction, the northerly monsoon blowing in the northern winter and the southerly monsoon in the northern summer. The rainfall is heavy; the amount and frequency vary considerably from one locality to another, being generally heaviest on coasts exposed to the prevailing monsoon. Over most of the area the southerly monsoon months have the least rain, but only in the south is there a definite dry season. Most of the area is outside the regions traversed by tropical storms, but they develop at times in the southern part; very rarely one has passed near the extreme northern part. There is sometimes considerable haze during the southerly monsoon.

Pressure.—From December to March the average pressure decreases slightly southward; from June to September it increases southward. Charts of the average distributions of pressure in January and July are given in the two diagrams preceding this page; it will be seen that in January, average pressure decreases from between 1009 and 1010 mb. in the north to between 1007 and 1008 mb. in the south; in July it increases from about 1008 mb. in the north to over 1011 mb. in the south. The other months may be regarded as transitional between these two distributions. Changes in the average monthly pressure in any particular locality are very small; irregular changes from day to day are also, as a rule, small. The most marked change is the regular diurnal oscillation which has a range of about 3 mb. Pressure is, on the average, highest at about 1000 and 2200, and lowest at about 0400 and 1600 local time. The table below gives for each hour the correction in millibars to be applied to the observed pressure to allow for the diurnal variation.

Local time	0	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
	mb.											
0–10° N.	–0.6	–0.1	+0.4	+0.7	+0.8	+0.7	+0.2	–0.3	–0.9	–1.3	–1.4	–1.3
0–10° S.	–0.6	–0.2	+0.3	+0.6	+0.7	+0.5	+0.1	–0.5	–1.0	–1.4	–1.4	–1.3
Local time	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
	mb.											
0–10° N.	–0.7	0.0	+0.7	+1.3	+1.5	+1.5	+1.1	+0.5	–0.2	–0.7	–1.0	–0.9
0–10° S.	–0.6	+0.1	+0.8	+1.4	+1.6	+1.5	+1.1	+0.5	–0.1	–0.6	–0.9	–0.9

The diagram below gives the equivalent in millibars of inches of mercury and *vice versa*.



Cyclonic disturbances.—Most of the area covered by this volume is too near the equator for the development of cyclonic disturbances. Only the extreme northern and the southern parts are occasionally 5 affected by tropical storms travelling in a westerly direction.

In the north, it is rare that the centre of a typhoon in the China sea passes near the islands. One is reported to have passed near the Talaud eilanden in October, 1904.

In the south, tropical storms have been reported near the Sermata 10 eilanden and have been traced back as far as the vicinity of the Kai and Aru groups. These storms have not, as a rule, reached their full intensity and are reported to be less severe than the typhoons of the China sea. Further information is given under "Local Weather, Section II" on page 28. 15

Details of the signs of the approach of tropical revolving storms and practical rules for avoiding them are given in the standard article on page xxxvii.

Winds.—Corresponding with the seasonal change in the pressure distribution there is a seasonal change in wind direction; northerly 20 winds, the northerly monsoon, blow from December to March and southerly winds, the southerly monsoon, from June to September.

To understand the variations in wind direction near the equator it should be borne in mind that the deflecting influence of the earth's rotation is in opposite directions north and south of the equator, and 25 increases with distance from it. An observer with his back to the wind has the lower pressure on his left hand in the northern hemisphere and on his right hand in the southern hemisphere (Buys Ballot's Law). From December to March, winds north of the equator are chiefly northerly or north-easterly, becoming north to north-west between the 30 equator and Lat. 5° S. and north-west to west, south of Lat. 5° S., where they are often known as the "West monsoon." From May or June to September the south-easterly monsoon blows in the southern part of the area, becoming southerly near the equator and from between south and south-west in the northern part of the area. South of the equator 35 it is often known as the "East monsoon." From March to April and from October to November are transition periods with variable winds. The monsoons, however, do not set in at the same time all over the area; the northerly monsoon sets in earlier in the north than in the south and the southerly monsoon sets in earlier in the south than the 40 north.

Near the equator from about Lat. 5° N. to Lat. 5° S., the monsoons are not very steady and near the islands they are often interrupted by local winds. Winds are mainly light. Between September and March 45 fewer than 10 per cent. of the winds observed at sea exceed force 4 except in February; similar data are not available for the other months, but it is unlikely that there is a larger proportion of stronger winds except perhaps near Lat. 5° S. in July and August. The monsoons increase in steadiness and strength southward; in the region

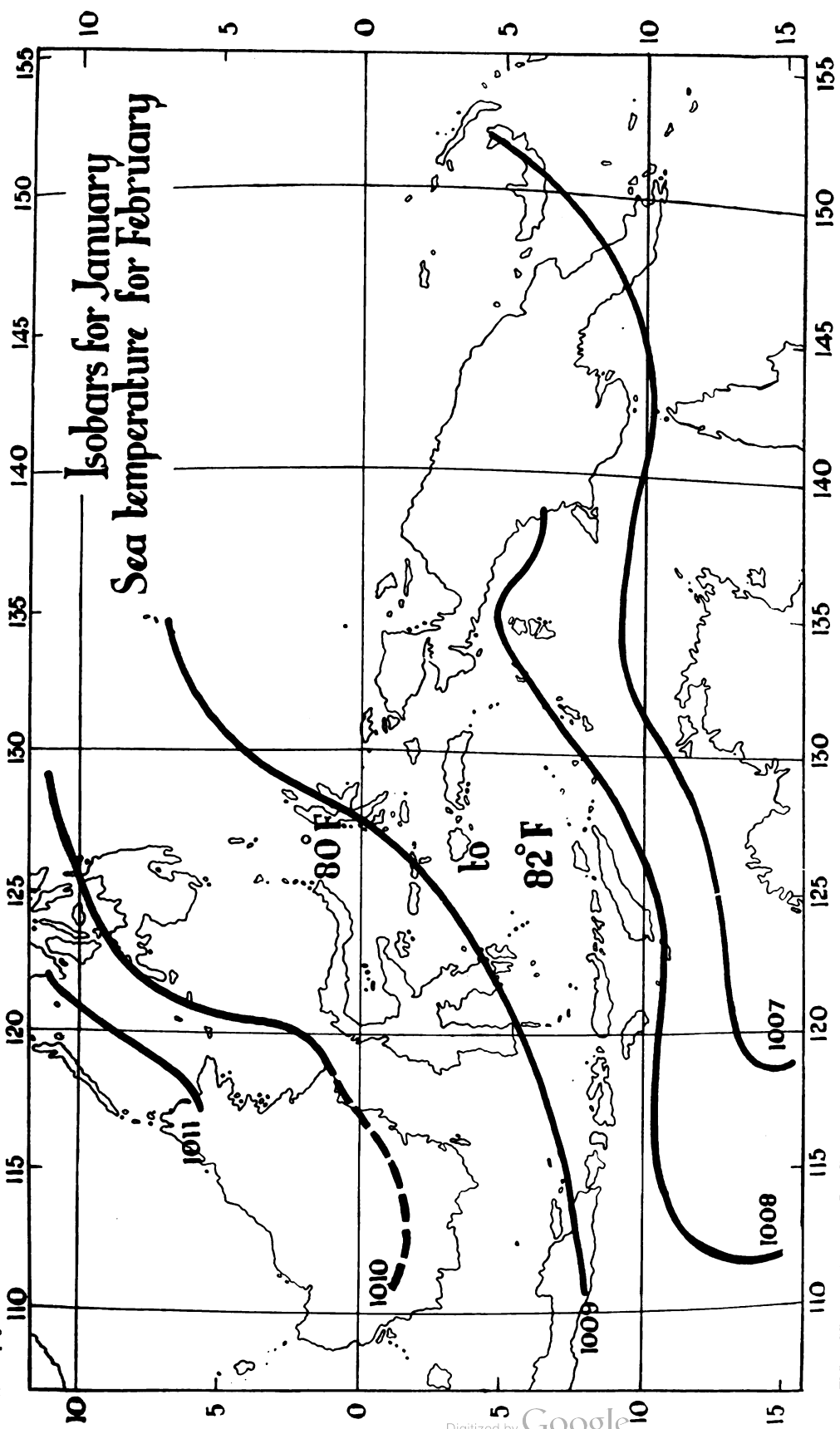
Lat. 5° to 10° S., Long. 130° to 140° E. from about 15 to 20 per cent. of the observed winds exceed force 4 in January and February. The strongest and steadiest winds occur, however, in this area during the southerly monsoon which, as stated above, blows from a south-easterly
5 direction. Data of the strength and steadiness of the winds are not available for this season, but it is probable that south of Lat. 5° S. and east of Long. 130° E. only about 30 per cent. of the winds are light in July and August when the monsoon is at its height. Considerable differences in the strength and steadiness of the monsoons may occur
10 from year to year.

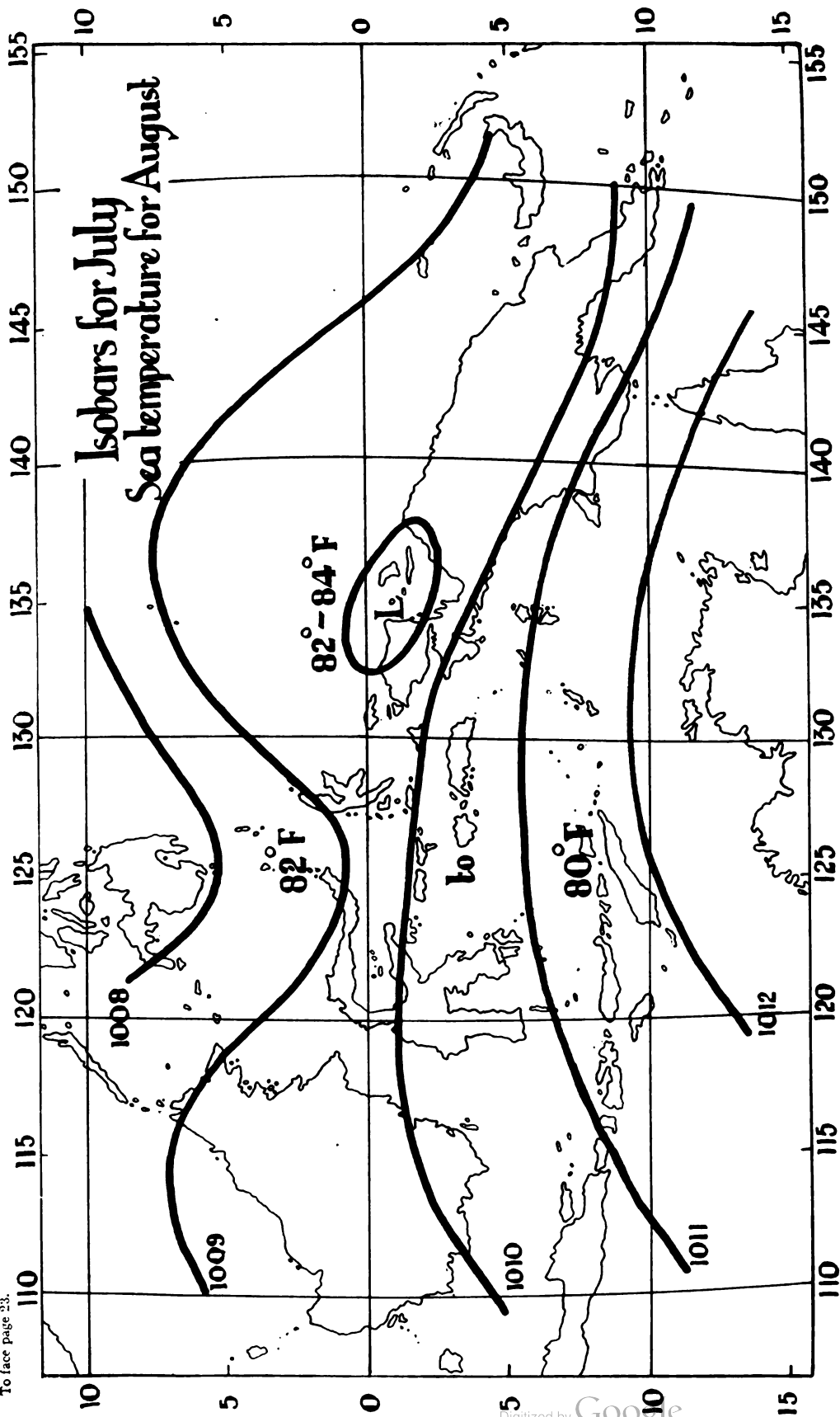
Gales and squalls.—There are a few gales. The chances of encountering a wind of force 7 or above are not likely to exceed one in 20 in any month, and are usually much smaller. The average number of days per month of the occurrence of any particular phenomenon at
15 sea is not available. The chances of encountering the various phenomena have, however, been estimated from ships' observations taken at regular intervals. Local squalls occur, however, and they may reach gale force for a short period. Between September and March squalls have been recorded at sea most often in January, when
20 the chances of encountering one are about one in 4 in the area Lat. 0° to 5° S., Long. 130° to 135° E. and about one in 6 in the areas Lat. 0° to 5° N., Long. 125° to 130° E. and Lat. 5° to 10° S., Long. 130° to 135° E. It has been estimated that the highest speed likely to be reached in a squall is about 48 knots; such high speeds are probably rare.

Land and sea breezes.—Near the coasts of the larger islands the wind is affected by land and sea breezes. These breezes are caused by the unequal heating and cooling, by radiation, of the land and sea. During the daytime the land is warmer than the sea and a sea breeze tends to blow on shore; at night the land is cooler than the sea and
30 there is a tendency for an offshore "land breeze." The conditions most favourable to the development of land and sea breezes are fine weather and a weak monsoon. Thus these breezes are best developed on coasts which are sheltered by high land from the prevailing monsoon; on such coasts they are the prevailing winds. On exposed coasts the
35 sea breeze reinforces the monsoon during the daytime; the land breeze may be sufficiently developed to produce a calm at night or may even over-ride the monsoon; this is unlikely unless there is high land near the coast or the monsoon is very weak. On coasts where the monsoon blows along them, the breezes deflect it. The sea breeze is usually
40 stronger than the land breeze except on coasts which are backed by high land. The strength of the breezes and the time of their onset varies along the coast and with the weather, depending largely on the direction of the monsoon with reference to the coast-line. On the sheltered coasts of the larger islands the sea breeze usually sets in
45 between 1000 and noon and is strongest in the early part of the afternoon when it may reach force 3; the land breeze usually sets in before midnight and lasts until about 0900. In wet weather, with overcast skies, there is little development of land and sea breezes. Information about these breezes on the different coasts is given under "Local Weather."

Sea temperature.—The average temperature of the surface of the sea varies between 80° and 84° . See diagrams facing pages 22 and 23. There is a slight tendency for the temperature to increase southward in the northern winter and northward in the northern summer.

Fog and visibility.—Fog is rare over the sea. Haze is prevalent
55 during the southerly monsoon, especially towards the end of the season in the south where in dry years it sometimes becomes dense. The haze





is partly caused by dust carried from northern Australia by the south-easterly winds and partly by smoke from the islands themselves where the fields are burnt in the latter part of the dry season. The haze becomes denser with an increase in wind speed and also with an increase in relative humidity; showers, however, cause a temporary improvement in visibility. Visibility is likely to be worst, therefore, where and when the humidity is high but no rain has fallen. Near the islands there is usually most haze in the early morning when smoke has been carried seaward by the land breeze. Further information is given under "Local Weather."

LOCAL WEATHER.—I. Molukka sea including the Talaud and Sangi eilanden: the north-eastern end of Celebes (Minahasa): Noordelijke Molukken: Sula eilanden: Ceram sea: Buru and Ceram and off-lying islands.

Winds.—Northern part of Molukka sea.—*Northerly monsoon.*—15 This monsoon sets in during November from between west and north-west; it becomes established in December when it veers towards north. It reaches its greatest steadiness in January and February when more than 25 per cent. of the winds observed exceed force 3. It blows mainly from between north-north-west and north-north-east, 20 being mainly north-north-west off Menado and north-north-east off the northern part of Halmahera. It dies away in April. No gales have been recorded at sea. Squalls are most frequent in January when the chance of encountering one is about one in 6. The northerly winds are usually accompanied by a swell. 25

Fresh or strong and squally westerly winds occur at times. At Menado they are known locally as "barat." In such weather the west and north coasts of Sangi are dangerous for sailing vessels. In the roadstead at Menado, the "barat" sometimes causes sufficient sea to interrupt communications with the shore. "Barat" squalls often 30 approach very rapidly, but warning may be given by a dark cloud westward. Occasionally these winds have caused damage on the coast at Menado. It is probable that these strong winds are associated with typhoons northward. For example, in November and December, 1892, strong "barat" occurred at Menado and two typhoons, one in 35 November and one in early December, passed southward of Mindanao.

During the northerly monsoon the land breeze is not well developed at Menado, blowing only for a few hours in the latter part of the night. The sea breeze reinforces the monsoon; from December to February the wind averages force 4 in the afternoon. Rede Menado is more 40 exposed in November when the wind blows from between west and north-west than later in the season when the prevailing direction becomes more northerly.

Southerly monsoon.—Southerly winds set in during May; the southerly monsoon blows from June to early October, being steadiest 45 in July and August. It blows mainly from between south and south-west but is south-south-east off the south-east coast of Minahasa.

Fresh southerly winds known locally as "slatan" sometimes blow for a few days. On the south-east coast of Minahasa the "slatan" is accompanied by a troublesome swell which sometimes renders loading 50 impossible in Rede Kema. The "slatan" on this coast is not, however, so strong as the "barat" on the north coast.

At this season the sea breeze at Menado sets in late (probably from about 1200 to 1300) and at the height of the monsoon blows only for 4 or 5 hours in the afternoon. 55

Intermonsoon months.—In April northerly winds are the most frequent and in October southerly winds. Near the island of Sangi the weather is said to be calm in October, but a swell comes from the north.

- 5 **East coast of Halmahera.**—*Northerly monsoon.*—In Bocht van Galela the monsoon blows from north-north-east, and is fairly steady. In Weda baai the wind is light and the sea calm, except in the north-western part, which is affected by north-westerly winds which sweep through the valleys into the north-western corner of the bay.
- 10 In February and March when the northerly monsoon is blowing its hardest northward of Weda baai, stronger winds, travelling across the narrow strip of land which starts at Tandjung Remdi, are encountered suddenly eastward of this point. Emerging from the lee of Tandjung Ngolopopo heavy seas and high surf running with the full force of the
- 15 ocean will be met with northward. The period of change sets in at the end of March, and practically no more strong northerly winds will be encountered, though northward of Tandjung Ngolopopo a gentle northerly wind will still be blowing.

Southerly monsoon.—In Bocht van Galela the monsoon is weak and

20 land and sea breezes prevail, the wind is south-easterly during the day and between south-west and west at night. In Buli baai the weather is said to be better than during the northerly monsoon; winds become variable in the inner part of the bay. In Weda baai at the commencement of the monsoon squalls from south-west are experienced, occasion-

25 ally increasing to a gale with heavy rain. The monsoon blows steadily from the middle of June, when the winds are southerly to south-south-easterly.

Heavy seas are experienced on the north coast, making communication with the shore difficult; there is, however, a sheltered anchorage

30 at all times off the village of Mesa and in Baai van Kokka.

Southern part of Molukka sea.—*Northerly monsoon.*—This monsoon sets in about the beginning of December and the wind may blow from any direction within the north-west quarter. From

35 January to March, when the monsoon is at its height, it blows mainly between north-west and north; about 15 per cent. of the winds observed exceed force 3. There is sometimes a swell.

At Ternate the monsoon is not established until January; it blows until March. At Labuha it is said to be mainly north-westerly but not steady. The land breeze from Halmahera does not reach

40 Ternate.

In Sula eilanden the monsoon sets in about the middle of November, the wind draws gradually round northward. Between November and January there are occasional squalls from south-westward, which generally last only a few days, sometimes only a few hours, but which

45 are dangerous to small craft. Calms are infrequent. A sea breeze sets in between 0900 and 1000, and a land breeze between 1900 and 2000.

From October to May a calm sea may be met with on the south coast of the large islands, the east coast of Sanana, and the northern part

50 of the west coast of that island.

Near Straat Tjapalulu, where the force of the monsoon is pent in by low hills, the effect of the northerly monsoon is often experienced on the south coast of the islands.

Southerly monsoon.—This monsoon sets in towards the end of April

55 and increases in strength and steadiness until July, when it is at its height, and is steady from between south-east and south. It decreases

in strength during October. Swell is most frequent from June to August.

At Labuha the monsoon blows from south-south-west.

In the Sula eilanden it blows from the middle of May until the middle of September. From April to November the sea is calm on the northern coast of the large islands, and on the southern portion of the east coast of Sanana. 5

Intermonsoon months.—Winds are variable in April but westerlies are the most frequent; in November winds are mainly light from south, through west, to north-west. 10

Ceram sea, Ceram and Buru.—*Northerly monsoon.*—The monsoon blows from December to March mainly from north-west, but it is not very steady. The sea is generally calm. Squalls are recorded most often in December (in about one observation in 10). They are said to occur on the north coast of Ceram, and also in Baai van Ambon. 15

Land and sea breezes develop on the southern coasts of Buru and Ceram. At Amahai winds are mainly northerly in the morning, westerly in the afternoon, and north-easterly in the evening. At Ambon winds are mainly north-westerly and there is little development of land and sea breezes (*see* Climatic table on page 33). 20

Southerly monsoon.—This monsoon sets in during May but it is light and unsteady and remains so during June. It reaches its height during August but is never very steady. It blows from between south-east and south. Its strength decreases during October but south-easterly winds are still the most frequent. The sea is usually calm, though a swell is said to occur rather frequently. The monsoon is not felt on the north coast of Ceram, where land and sea breezes prevail with fine weather. Land and sea breezes also develop on the south coast; at Amahai winds are mainly northerly in the morning and south-easterly in the afternoon and evening. At Ambon, winds are mainly from between east and south-east; sudden squalls are said to occur in Baai van Ambon. 30

In Baai van Kajeli, on the north-east coast of Buru, land and sea breezes succeed one another regularly; the sea breeze from about 0900 to 1100, and the land breeze from about 1700 to 1800, so that sailing vessels have no difficulty in leaving the bay in the evening or at night. 35

Intermonsoon months.—In April winds are variable but westerlies are the most frequent; in November winds vary from south, through west, to north-west. 40

Air temperature and humidity on the coasts.—The average temperature is a little below 80°. There is very little change throughout the year. In the north January and February are the coolest months and July to September the hottest; in the south the seasonal change is reversed. Daily maximum temperatures average from 80° to 85° in the coolest months and from 85° to 90° in the hottest months. Night minima average from 72° to 75°. Maxima are higher in the dry season than in the wet and tend to occur about an hour later; minima are lower in the dry season. On the small islands, the diurnal variation is smaller than on the larger islands and is about 10°; maxima are slightly lower and minima higher than on the large islands. In very wet weather the diurnal variation is slight, but the temperature may fall rapidly several degrees during a heavy shower. On coasts which are backed by high land, cool winds descend from the mountains at night; such winds are experienced, for example, on the coasts of Ceram. Temperature does not often rise above 95° and is not likely to 55

fall below 65° near sea level. The highest temperatures usually occur towards the end of the dry season.

The humidity is, in general, high except on those coasts which are sheltered by high land from the prevailing monsoon. The average monthly values are from 75 to 85 per cent. in the drier months and from 85 to 90 per cent. in the wet season. The relative humidity is usually highest just before sunrise when the average exceeds 95 per cent.; it is lowest about noon with an average value of from 60 to 65 per cent. in the driest months and from 70 to 75 per cent. in the wet season.

Cloud.—The average amount of cloud is about 6 tenths. It is rather more close to windward of high land and also during the northern winter, rather less to leeward of high land and during the southerly monsoon season.

The most prevalent cloud is cumulus. During the rainy season large cumulus clouds build up, often developing into cumulonimbus. Over the land they form mainly during the day; the mountains usually become enveloped in the rainy season and often in the drier season. Over the sea, cumulus clouds are more prevalent at night. In the early morning over the land there are usually sheets of altostratus. During the dry season stratocumulus is the prevailing type.

Rainfall.—The rainfall is heavy; most coasts receive more than 80 in. a year, and on some of the coasts, for example, on the north coast of Celebes, parts of the Talaud and Sangi groups, and on the south coast of Ceram, the yearly average exceeds 100 in. Among the less rainy regions with yearly averages of from 60 to 80 in. are Kema, Batjan and Obi Major, and the north coast of Buru. The rain is seasonal; in general the months from July to October are the driest but they are not rainless. Over most of the area the wettest months are either those of the northerly monsoon, or the intermonsoon months from March to May, when heavy thunder-showers occur. On coasts exposed to the northerly monsoon, especially those to windward of high land, the former season preponderates. For example, at Menado, and at Wahai, on the north coast of Ceram, there are from 15 to 20 rainy days a month between December and February. (The rainy days referred to in this section include days with small amounts of rain; except where otherwise stated they are defined as days with 0.02 in. or more.) At Sanana, March to June are the wettest months, with 15 or 16 rainy days and falls of 10 in. a month. During the drier months, from July to October, rain falls on from about 7 to 10 days a month.

Exceptions to the seasonal distribution, mentioned above, are coasts which are sheltered from the northerly monsoon and exposed to the southerly monsoon, for example, the shores of Weda baai on the east coast of Halmahera, and the south coasts of Buru and Ceram. These coasts are wettest from May to August, when there are from 15 to 20 rainy days a month. On the islands of Ambon and Saparua, which are very wet at this season, there are from 20 to 25 in. a month, on from 20 to 24 days. The northerly monsoon is the driest season. A small part of the south coast of Ceram, however, has a climate similar to that of the north coast, viz., Schiereiland Hoalmoal and that part of Piru baai westward of Kampung Kaibobo. The separation is very sharp. Rice planting, which is done in the rainy season, takes place at Kaibobo and westward in December and January, just as on the north coast, while at Hatusua, a few miles south-eastward of Kaiboob, it takes place in June and July. This is caused by the high land of Ambon intercepting the moisture brought by the southerly monsoon.

Mean monthly and annual rainfall in inches.

Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Kema	6.1	6.3	6.6	6.7	6.8	5.9	4.4	3.1	3.1	4.2	6.2	6.3	65.7
Ternate	8.2	7.4	7.8	9.1	9.4	8.3	5.3	4.3	4.4	5.4	7.9	8.8	86.3
Kajeli	8.4	8.3	8.9	6.7	6.7	8.1	6.7	4.8	2.4	1.9	3.1	7.7	73.7
Wahai	11.4	15.1	12.6	8.1	6.3	4.9	4.2	3.5	3.4	3.7	4.4	7.7	85.3
Amahai	4.4	4.3	5.6	8.3	14.2	15.6	17.9	15.0	8.5	5.5	4.2	4.1	107.6
Saparua	4.3	4.4	5.6	10.0	20.3	25.4	24.1	17.2	10.5	7.2	4.1	5.5	138.6
Naira	9.6	8.1	9.1	12.8	15.4	14.2	8.4	4.3	4.4	4.4	5.2	9.5	105.4
Tual	14.1	12.4	12.5	10.1	8.7	5.7	4.4	2.7	2.1	3.5	6.3	11.9	94.4
Saumlaki	9.8	9.2	8.4	9.1	9.1	5.5	2.8	0.7	0.2	1.2	2.1	7.7	65.8
Merauke	10.1	9.3	10.2	7.3	5.0	1.9	1.6	0.9	1.3	1.9	3.4	7.4	60.3

Estimated number of days with heavy rain (0.4 in. or more).

Place	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Kema	4	4	5	5	5	4	3	2	2	3	4	5	46
Ternate	6	5	5	6	7	6	4	3	3	4	5	6	60
Kajeli	6	6	6	5	5	6	5	3	2	1	2	3	52
Wahai	8	11	9	6	4	3	3	3	2	3	3	5	60
Amahai	3	3	4	6	10	11	12	10	6	4	3	3	75
Saparua	3	3	4	7	14	18	17	12	7	5	3	4	97
Naira	7	6	6	9	11	10	6	3	3	3	3	7	74
Tual	10	9	9	7	6	4	3	2	2	2	4	8	66
Saumlaki	7	7	6	6	6	4	2	1	0.1	1	1	5	46
Merauke	7	7	7	5	4	1	1	1	1	1	2	5	42

Authority.:—Batavia, K. Magn. en Meteor. Obs. Verhand. No. 24. Regenval in Nederlandsch-Indië.

Meteorological Office, Air Ministry.

The estimated number of days per month in which there is heavy rain (0.4 in. or more) is given in the table facing this page. Data for Menado and Ambon are given in the Climatic tables on pages 33 and 34, respectively.

- 5 During the rainy monsoon the rain falls in frequent heavy showers of large extent; on coasts to windward of high land it often becomes continuous. Rain falls at any time of the day or night, but on coasts exposed to the monsoon there is a tendency for the night and either the forenoon at Ambon, or the early afternoon at Menado to be the wettest
10 times. During the intermonsoon months and the drier season rain falls chiefly in local showers, which, in the former season, are sometimes accompanied by thunder. These showers occur most often in the afternoon (earlier in the intermonsoon months than the dry season) over the land and during the latter part of the night at sea.
- 15 **Fog and visibility.**—No fog has been recorded in observations at sea in this area. Visibility is usually good in the northerly monsoon, except during heavy rain. Mist in the valleys may form in the early morning after rain.

During the southerly monsoon the weather is sometimes hazy. This
20 haze increases with the advance of the season and is generally worst in September and early October. Visibility improves temporarily after showers, but the haze does not disperse finally until November. At sea, in September, the chance of encountering mist or haze (which may reduce visibility to less than 5 miles) is about one in 10 in the southern
25 part of the area and slightly smaller north of the equator. There is a slight improvement in the south in October and November; by December the chance of mist or haze is everywhere less than one in 20 except off the south coast of Ceram.

Haze is worst in particularly dry years; for example, in 1914, it was
30 reported that in September and October the sea was sometimes invisible from the lighthouse at Nusanive at a height of about 400 feet (121^m9) on the southern side of Ambon.

**II. Banda and Arafura seas including Banda, Kai, Aru, Sermata and Tanimbar eilanden: the north-western and
35 western coasts of New Guinea with off-lying islands (Waigeo, Salawati).**

Winds.—**Banda sea, including Banda eilanden and islands between Timor and Kai eilanden.**—*Northerly monsoon.*—This monsoon begins in December or the end of November with westerly
40 winds and is at its height in January and February, blowing from between west and north-west; in these months about 25 per cent. of the winds observed in the western part of the sea and 35 per cent. in the eastern part exceed force 3. The monsoon is moderately steady in these months but becomes unsteady in March though it still prevails.
45 In the east near Kai eilanden the monsoon is occasionally interrupted by northerly winds and also by strong westerly winds. Gales of force 7 have been recorded in the eastern part in January and February, but the chances of encountering one are only about one in 100. Squalls have been recorded mainly in January, when, in the eastern part of the
50 sea, the chances of one occurring are about one in 6. On the east coast of Nuhu Tjut local squalls, which are dangerous to the native boats and even give trouble to power vessels, often occur near the village of Fako. These squalls are most dangerous near the shore on account of their sudden onset; further out the movement of the water gives
55 warning of their approach.

Southerly monsoon.—This monsoon begins in the latter part of April

and becomes established during May; it lasts until October in the north and November in the south. It blows very steadily from June to August in the north and from May to September in the south, its direction being south-easterly. Its strength averages force 4 and is more uniform than that of the northerly monsoon. The monsoon is said to be stronger in the southern part of the Banda sea than in any other part of the archipelago. Squalls occur on the west coast of Nuhu Tjut near Nirun, situated 9 miles southward of Nuhu Jaan, Dangar and Hor. 5

Intermonsoon months.—In April winds between east and south-east are the most frequent. In November winds are south-easterly in the south and variable in the north. 10

Tropical storms affect the islands north-eastward of Timor chiefly in April, but sometimes in late March or early May. The storms travel in a westerly direction. By means of rainfall data, some of them have been traced back as far as the Kai and Aru eilanden, others probably develop farther west. There are not sufficient data available to indicate their frequency, but gales are not likely to occur more than once a year. A storm was reported in April, 1778, as far north as the Banda eilanden. 15

Arafura sea, including the Aru eilanden.—*Northerly monsoon.*—This monsoon blows from December to February, when it is moderately steady from between west and north-west; in January and February about 40 per cent. of the winds observed exceed force 3 and from about 15 to 20 per cent. exceed force 4. Gales of force 7 have occasionally been recorded in February, when the chances of encountering one are about one in from 25 to 30. Squalls are most frequent in January, when the chances of one occurring are about one in 8. Near the Aru eilanden they are said to be heavy and accompanied by much rain. On the east coast of the Aru eilanden the wind is mainly north-north-west. On the north coast and the east coast as far as Watulei, the tidal stream on the falling tide setting against the wind causes a considerable sea. 20 25 30

Southerly monsoon.—This monsoon sets in about the middle of April when winds are light and rather variable from between south and east. It is steady from June to September, especially in July and August, from a south-easterly direction. It becomes unsteady after the middle of October. 35

Intermonsoon months.—In March and April, winds are variable; westerlies are the most frequent in March, and winds from between east and south in April. At this season tropical storms sometimes occur (see under Banda sea, above). In November, though winds are variable, south-easterlies are the most frequent. Land and sea breezes prevail on the coasts. 40

Coast of New Guinea (westward of Omba rivier).—*Northerly monsoon.*—This monsoon sets in on the north coast in November and on the west coast during December. It is unsteady on the west coast in this month; south-westerly winds appear to be the most frequent. The monsoon is at its height in February when about 20 per cent. of the winds observed exceed force 3. It blows from between north-west and north-east on the north coast and is north-westerly on the west coast, but its direction is influenced by the coast line. It decreases in March. Squalls are most frequent in January when the chances of encountering one are about one in 4. Sharp local squalls have been reported in Straat Sélé in February and March, they usually occurred at night or in the afternoon. In Mc Cluer golf the monsoon raises a certain amount of sea; during heavy squalls the strong tidal streams make conditions 45 50 55

difficult for small craft. Heavy squalls blowing down from the mountains, accompanied by rain, have been reported in Etna baai; they usually occurred in the afternoon. At the onset of the monsoon there was a swell from south-west, which was felt as far as the entrance
5 at Tandjoeng Itéwi. Rather more often than not there is a noticeable swell along the north coast.

Southerly monsoon.—This monsoon sets in at the end of April and lasts until September or October, decreasing in strength and steadiness after August. It blows from between south-east and south-west, being
10 mainly from between south and south-west on the north coast and between south-east and south on the west coast. On the north coast of Waigeo heavy squalls blow down from the mountains at night and in the forenoon. In Mc Cluer golf the monsoon strengthens the land breezes; in Golf van Bintoeni squalls come off the land.

15 *Intermonsoon months.*—In late March and April winds are variable and squalls are said to be frequent.

Coast of New Guinea (eastward of Omba rivier).—See Arafura sea.

Temperature on the coasts.—Few data are available. Mean
20 temperature varies between about 77° and 83°.

Observations made on the Kai eilanden for one year gave an average daily maximum of 87° and minimum of 77°. The warmest months were from February to April and from September to October, with mean temperature of from 82° to 83°. The period between June and
25 August was the coolest, with a mean temperature of from 79° to 80°. The highest temperature recorded was 95° and the lowest 71°.

On the north and north-west coasts of New Guinea there is very little variation throughout the year; daily maxima average from 85° to 87° and daily minima from 72° to 74°. In Mc Cluer golf the nights are said
30 to be cool. On the southern part of the west coast there is a slightly cooler season during the southerly monsoon. Golf van Bintoeni, also, is said to be the coolest at this season.

Rain showers may cause a sudden decrease of temperature of about 8°.

35 *Cloud.*—At sea during the northerly monsoon, average cloudiness is from about 5 to 6 tenths in December, increasing to from 7 to 8 tenths in January, subsequently diminishing again to about 6 tenths in March. On coasts exposed to the monsoon, for example, the north and north-west coasts of New Guinea, average cloudiness reaches from 7 to
40 8 tenths in January. There is less cloud during the southerly monsoon, when the average is probably from 4 to 5 tenths at sea and from 5 to 6 tenths along the southern part of the New Guinea coast. Remarks on the type of cloud made in Section I (page 26) apply also to this area. During the southerly monsoon stratocumulus clouds are
45 common.

Rainfall.—In the south there is a marked dry period during the southerly monsoon between late June and October. The drought is particularly marked in the south-west, in the Sermata and Tanimbar groups rain falls on only from 5 to 10 days in this period. (The rainy
50 days referred to in this Section include days with small amounts of rain; except where otherwise stated they are defined as days with 0.02 in. or more.) This season is not so dry on the Kai and Aru groups, where rain falls on from 5 to 9 days a month between July and October. In November there are a few days with rain, but most of the
55 rain falls between December and May with from 10 to 20 days a month and from 8 to 12 in. on the coasts in the wettest months. Coasts

exposed to the northerly monsoon are wettest during that season, the other coasts are wettest in the intermonsoon months, March and April, when rain falls in thundery showers.

On the Banda eilanden, from August to October are the driest months, nevertheless rain falls on about 10 days a month; the intermonsoon months, April to June, are the wettest with about 20 days and from 12 to 15 in. a month. 5

Most of the rain falls in heavy showers.

On the northern and north-western coasts of New Guinea the wettest seasons occur either during the northerly monsoon or the intermonsoon months, with from 10 to 12 in. a month on from 12 to 20 days. In the former category are those coasts exposed to the monsoon, such as the north coast and the southern shore of Mc Cluer golf; in the latter category are, for example, Sorong, Fak Fak and the northern shore of the Mc Cluer golf including Golf van Bintoeni. On the north coast from September to November are the driest months with about 10 rainy days a month, but on parts of the west coast the southerly monsoon is not much drier than the rest of the year and rain occurs on about one day in two. Telok Bintoeni, which is sheltered, is said to have much fine weather during both monsoons, but during the southerly monsoon rain squalls come off the land. 15 20

Along the coast from Omba rivier to Eilanden rivier the southerly monsoon is the wettest season, though rain may occur in all months. During the southerly monsoon rain falls at any time of the day, a great deal falling in the morning; during the northerly monsoon the rain is mainly confined to afternoon showers. 25

Southward of Digoel rivier the southerly monsoon is the dry season, but showers may occur in all months. Merauke has only from 3 to 6 rainy days a month from June to November.

The estimated number of days per month with 0.4 or more of rain is given in the table on page 27. 30

Visibility.—Visibility is generally good in the northerly monsoon except during heavy rain storms. Over most of the area the chances of encountering mist or haze (visibility less than 5 miles) are about one in 20 or smaller. Mist and haze have been observed most often in the area from Lat. 3° to 10° S., Long. 125° to 130° E. in February where one or other has been reported on about one occasion in 10. 35

Haze increases during the southerly monsoon and reaches its maximum from September to November. In September and October the chances of encountering mist or haze exceeds one in 10 over most of the area except off the north-west and north coasts of New Guinea; the latter coast has little haze in October. In November conditions improve in the north and near the New Guinea coast, but in the Arafura sea, eastward and south-eastward of the Tanimbar eilanden, the chances of mist or haze are about one in 5. In this month visibility of less than half a mile has been recorded occasionally in an area extending over the Tanimbar, Kai and Aru groups to the coast of New Guinea. Off the Kai eilanden the haze (or dry fog) is said to be so thick at times that the natives are unable to find their way back to their villages. Near the Tanimbar eilanden thick haze which has the appearance of a grey fog, known as "Kuma Kuma," is said to occur every five or six years when it may persist for several days. Off the Aru eilanden, in October, during the survey by H.M.S. *Flying Fish*, the land was always enveloped in thick haze, and seldom visible more than 2 miles. In November the haze was not so thick as in October, and a few clear days were experienced. 40 45 50 55

Visibility improves in December when the chances of mist or haze are less than one in 10.

On the Kai eilanden there is said to be a mist on the ground during the cool nights of the dry season from August to October.

5 **Climatic tables.**—The tables on pages 33 and 34 give statistics for land stations at which there is a regularly reporting weather station. The figures given are averages, percentage frequencies or extremes, as stated; it must be realised that these values refer to the actual positions in which the weather has been observed, and *not* necessarily
10 to the open sea or to the approaches to ports in the vicinity. The tables for land stations should therefore be consulted with discretion, especially as regards wind, visibility, cloud, temperature and humidity, since all these elements are affected, some a great deal, by local conditions. The following notes indicate ways in which conditions
15 over the open sea may differ from those at the nearest reporting station for which a table is published.

(1) Temperature over the sea is less variable than over the land; for example the nights are generally warmer at sea, and the days cooler, than over the land.

20 (2) Rainfall at most coast stations in this area is affected by neighbouring mountains, and the influence of the mountains generally decreases over the open sea with increasing distance from the land.

(3) The frequency of cloudy days on the coast often differs widely from the frequency a few miles out at sea, and similarly for clear days
25 (see section on Cloud, page 26).

(4) Wind speed is generally greater at sea than on the coast, and there may be twice as many gales at sea than at the nearest shore stations, but such a difference would not exist if the shore stations were in open positions on headlands or on low lying islands devoid of shelter.

30 Wind direction may also be greatly affected (see "Local modifications of the weather near the coast," page xlviii).

PLACE—AMBON. LAT. 3° 42' S., LONG. 128° 10' E. Height above Mean Sea Level, 14 feet.
CLIMATIC TABLE COMPILED FROM 5 TO 50 YEARS' OBSERVATIONS, 1879 TO 1936.

MONTH	PRES- SURE at M.S.L. Mean	AIR TEMPERATURE				Relative humidity		Cloud amount	RAIN		WIND DIRECTION †												No. of days with fog or mist	No. of days with gales							
		Daily max.	Daily min.	Highest in each month	Lowest in each month	0600 1400 am pm			Average fall	No. of days with 0.02 in. or more	0.4 in. or more	Percentage of observations from						Percentage of observations from													
												N	NE	E	SE	S	SW	W	NW	Calm	N	NE			E	SE	S	SW	W	NW	Calm
January . . .	mb.	°F.	°F.	°F.	°F.	%	%		in.	†	13	16	7	3	3	3	7	13	19	19	—	—	—	—	—	—					
February . . .	1009	88	76	92	74	89	66	—	5.0	†	13	18	4	3	0	7	25	25	0	—	—	—	—	—	—	—					
March . . .	1009	88	76	91	74	90	67	—	4.7	†	12	15	4	6	3	10	16	29	10	—	—	—	—	—	—	—					
April . . .	1009	86	76	90	73	92	73	—	5.3	†	15	18	8	7	7	10	13	7	13	7	—	—	—	—	—	—					
May . . .	1009	84	75	88	72	92	74	—	11.0	†	10	10	13	17	3	6	3	6	3	13	3	—	—	—	—	—					
June . . .	1010	82	74	85	71	91	76	—	20.3	†	3	10	36	23	3	3	3	3	3	3	24	—	—	—	—	—					
July . . .	1011	81	74	84	70	90	76	—	25.1	†	0	17	27	13	0	13	3	3	3	10	—	—	—	—	—	—					
August . . .	1011	81	74	85	69	89	75	—	23.7	†	0	16	39	26	3	0	0	3	7	—	—	—	—	—	—	—					
September . . .	1011	83	74	86	71	91	71	—	15.8	†	3	13	26	45	3	0	0	3	0	10	—	—	—	—	—	—					
October . . .	1010	85	74	89	71	91	68	—	9.5	†	0	3	19	45	7	6	7	3	0	18	—	—	—	—	—	—					
November . . .	1009	88	75	91	72	92	66	—	6.1	†	3	0	17	33	7	13	7	10	13	—	—	—	—	—	—	—					
December . . .	1008	88	76	92	73	91	64	—	5.3	†	10	6	7	13	3	19	13	10	19	—	—	—	—	—	—	—					
Means . . .	1010	85	75	92*	69**	91	70	—	—	—	6	10	18	24	4	8	9	9	9	13	—	—	—	—	—	—					
Totals . . .	—	—	—	—	—	—	—	—	136.1	96	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
Extreme values . . .	—	—	—	96†	61††	—	—	—	—	—	5						—						—	—							
No. of years' observations . . .	29-30	18				15-18				50		—												—	—						

Standard of time = L.M.T.

* Mean of highest each year.

** Mean of lowest each year.

† Highest recorded temperature.

†† Lowest recorded temperature.

Authorities: Batavia, K. Mag. en Meteor. Obs. in Netherlands Indies.
Buchan, Report on Atmospheric Circulation.

‡ Estimated.
§ From observations at 0600, 0900, 1500, 3000.

Meteorological Office, Air Ministry.

PLACE—MENADO. LAT. 1° 30' N., LONG. 124° 50' E. Height above Mean Sea Level, 5 feet.
CLIMATIC TABLE COMPILED FROM 12 TO 50 YEARS' OBSERVATIONS, 1879 TO 1933.

MONTH	PRES- SURE at M.S.L. Mean	AIR TEMPERATURE Mean of				Relative humidity		Cloud amount 0-10	RAIN		WIND DIRECTION																No. of days with fog or mist				
		Daily max.	Daily min.	Highest in each month	Lowest in each month	a.m. p.m.	0-0.01 in. or more		Average fall	a.m.								p.m.								Mean wind force or speed					
										Percentage of observations from								Percentage of observations from													
										N	NE	E	SE	S	SW	W	NW	Calms	N	NE	E	SE	S	SW	W			NW	Calms	a.m. p.m.	
January . . .	mb.	° F.	° F.	° F.	%		in.	21	13	18-3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
February . . .	1010	85	73	89	70	93	74	—	10	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
March . . .	1010	85	73	89	70	92	73	—	10	14-1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
April . . .	1009	87	73	89	70	92	73	—	6	7-8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
May . . .	1009	87	73	90	71	92	73	—	4	6-3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
June . . .	1008	87	74	90	71	91	71	—	4	6-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
July . . .	1009	87	74	90	71	90	70	—	3	4-7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
August . . .	1009	89	73	91	70	86	64	—	3	3-8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
September . . .	1009	89	73	93	69	86	63	—	9	3-8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
October . . .	1009	89	73	92	69	86	64	—	3	3-4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
November . . .	1009	87	73	91	70	92	72	—	6	4-8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
December . . .	1008	86	74	89	71	92	73	—	10	14-6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Means . . .	1009	87	73	94*67**	90	89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Totals . . .	—	—	—	—	—	—	—	—	—	104-8	163	71	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Extreme values . . .	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of years' ob- servations . . .	15	14-16	12-15	12-15	13-15	13-15	80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Standard of time = L.M.T.

* Mean of highest each year.

** Mean of lowest each year.

† Highest recorded temperature.

†† Lowest recorded temperature.

‡ Estimated.

Authorities:—Batavia, K. Mag. en Meteor. Obs. in Netherlands Indies.

Meteorological Office, Air Ministry.

CHAPTER II

ISLANDS BETWEEN MINDANAO AND CELEBES, NORTH-EASTERN END OF
CELEBES, AND NOORDELIJKE MOLUKKEN, EXEPT OBI EILANDEN.*Chart 2575.*

NANUSA EILANDEN. — **Dangers.** — Nanusa eilanden, lying 112 miles east-south-eastward of the southern extremity of Mindanao, are mostly hilly. Marampit, the largest and highest of the group, has an elevation of 539 feet (164^m3), but the most distinctive island is Kakarutan, which has a conical peak, 346 feet (105^m5) high. The southern part of Marampit slopes steeply in the form of limestone terraces. Intata and Kakarutan lie on the same reef, which dries, at the southern end of the group. On the outer edge of this reef north-eastward of Intata (*Lat.* 4° 39' N., *Long.* 127° 09' E.), is Ondengbui, a flat and bare rocky islet, except for some rocks, covered with vegetation, on its western side; there are also some rocks between Ondengbui and Intata. Malo, south-westward of Kakarutan, is fringed by a wide reef which dries. (*See view facing page 36.*)

A 29-foot (8^m8) patch lies about one mile northward of Karatung situated about 1½ miles south-westward of Marampit; it is well marked by discoloration under favourable conditions. Napu Arampua, a 10-foot (3^m0) patch lies 4 miles southward of Karatung. The passage between Kakarutan and Malo is encumbered with reefs, and should not be used.

A bank, with a depth of 15 fathoms (27^m4) over it, was reported, in 1946, to lie nearly 2 miles southward of Kakarutan.

The water around the islands is very clear; the bottom, which consists mostly of sand and stones, can sometimes be seen in a depth of 16 fathoms (29^m3).

Marampit, Karatung and Kakarutan are inhabited.

Marampit is well supplied with good drinking water.

Anchorages.—Good anchorage may be obtained by vessels with local knowledge during the northerly monsoon, southward and south-eastward of Karatung, off the village of the same name. During the southerly monsoon there is anchorage off the northern side of the island.

Vessels with local knowledge may obtain anchorage off the south-western extremity of Marampit, although the depths are great and the bottom steep; the depths are too great off the villages of Marampit and Luluhe, which stand on the southern side of the island.

Good anchorage may be obtained by vessels with local knowledge, in a depth of 27 fathoms (49^m4), northward of the reefs off the western side of Kakarutan. During the northerly monsoon vessels lie better

Charts 943, 1263.

Chart 2575.

southward of the passage between Kakarutan and Malo, or southward of Malo.

Current.—In February, 1875, H.M.S. *Challenger*, whilst dredging southward of the Nanusa eilanden, experienced for 8 hours a steady southerly current with a rate of one knot.

TALAUD EILANDEN.—Talaud eilanden consist of Karakelong, Salebabu and Kaburuang, all thickly wooded and inhabited islands, lying south-westward of Nanusa eilanden. The coasts are mostly steep and rocky, interrupted in places by small sandy beaches or marshy flats.

Local weather.—See page 23.

Karakelong.—**Anchorage.**—Karakelong, the principal island of the group, is mountainous, the mountains being divided into two parts by a lower part, which is clearly visible. In the northern and wider half there is a ridge running in a northerly and southerly direction, with Duata, the summit, 2,229 feet (679^m₄) high, situated about 15 miles from Tandjung Ambora, the northern extremity of the island, and Berawang, 1,573 feet (479^m₄) high and prominent, about 7 miles from the same point. Northward of this ridge there is lower hilly land, which approaches the coast in places and forms steep points. On the west coast at the northern end there are detached mountains with spurs extending to the coast. See view facing this page.

The coastal reef is mostly narrow and steep-to, and the least swell causes heavy breakers on it. Landing on the coastal reef is difficult, but there are several small sandy beaches. The coast is in general steep, but anchorage may be obtained in many places, although in considerable depths. There is no safe anchorage, however, throughout the year, except off Kampung Kama, in Straat Lirung. Most of the settlements are not visible from seaward.

Off the north coast anchorage may be obtained, in a depth of from 7½ to 13 fathoms (13^m₇ to 23^m₈) by vessels with local knowledge in Baai van Bambang, entered about 2 miles eastward of Tandjung Ambora. There is also serviceable anchorage off Kampung Manahan, situated in a cove close eastward of Tandjung Ambora.

Chart 2193, plan of Baai van Essang.

Baai van Essang is entered between Tandjung Papetu, a rocky point situated about 4½ miles southward of Tandjung Ambora (Lat. 4° 34' N., Long. 126° 48' E.), and Tandjung Bualo, about 1½ miles farther southward. The shores of the bay are low, and at its head is Kampung Essang, which can be identified by a boat shed. Sungei Essang flows into the bay close northward of the village; surf quickly rises on the wide bank off the mouth.

Good anchorage may be obtained, in a depth of about 25 fathoms (45^m₇), with the steep southern bank of the river bearing 086°, and Tandjung Papetu, 002°. It is unadvisable to anchor close off the village, as the bottom is very steep there, and a strong stream flows out of the river during heavy rains.

Chart 2193, plan of Baai van Batoembaranggo.

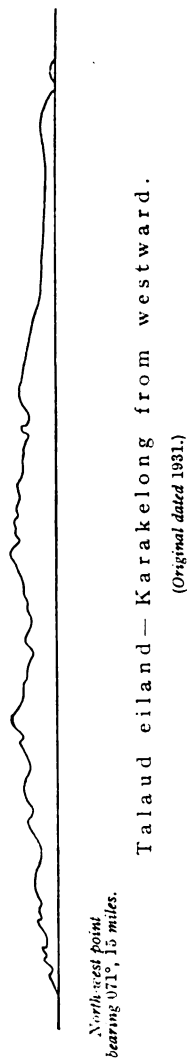
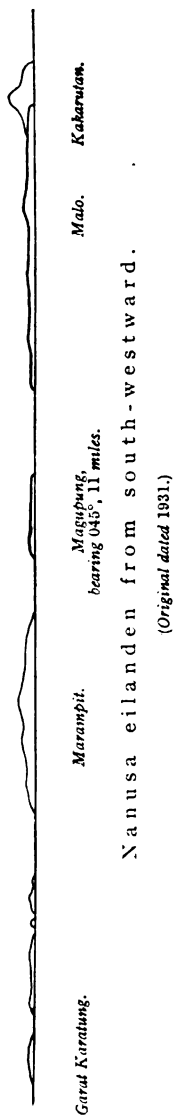
Baai van Batoembaranggo, entered about 4 miles south-south-westward of Tandjung Bualo, affords anchorage on its northern side, in depths of from 16 to 19 fathoms (29^m₃ to 34^m₇).

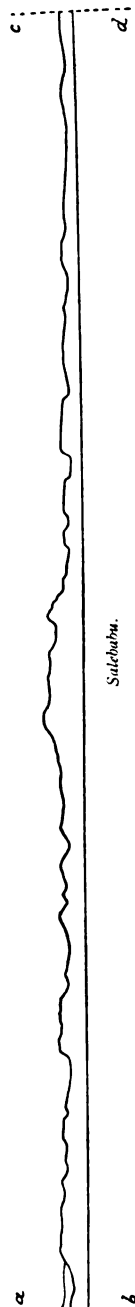
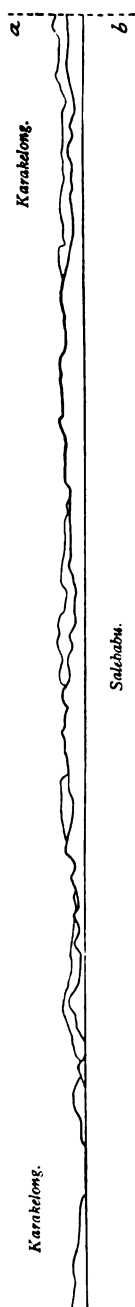
Chart 2575.

Other anchorages are in Baai van Meriri situated close southward

Charts 943, 1263.

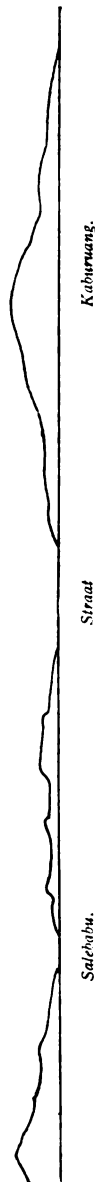
To face page 36.





South point.
Salchabu, bearing 081°, 24 miles.

View, in three parts, of southern part of Talaud eilanden from west-south-westward.
(Original dated 1931.)



Strait
Kaburuang,
bearing 015°, 20 miles.

Southern part of Talaud eilanden from south-westward.
(Original dated 1931.)

Chart 2575.

of Baai van Essang and in Baai van Ambia, situated close northward of Baai van Batumbarango. There is also serviceable anchorage between Nusa Dolong and the main coast.

Nusa Dolong or Jolly eiland lies about three-quarters of a mile offshore about $5\frac{1}{2}$ miles southward of the southern entrance point of Baai van Batumbarango. There is a prominent white tombstone on the islet. Nusa Topor lies close offshore about one mile south-south-eastward of Nusa Dolong. A reef, with a depth of about 6 feet (1^m8) over it, lies about 3 cables west-south-westward of Nusa Topor.

Chart 2193, plan of Reede Beo.

Rede Beo.—Light.—Anchorages.—Kampung Beo, situated about 5 miles south-eastward of Nusa Topor, is the principal settlement of the island. It stands close within the southern extremity of a bay, the shores of which are fringed by a drying bank. There is a jetty, which nearly dries at its head, at Kampung Beo, and westward of it the bank consists of coral, but elsewhere of mud. There is a conspicuous tree standing on the coast about a quarter of a mile south-south-westward of the jetty.

The limits of the roadstead are the meridian of $126^{\circ} 47'$ E. and the parallel of $4^{\circ} 13' 30''$ N.

Two detached reefs lie on the coastal bank about three-quarters of a mile and $1\frac{1}{2}$ miles, respectively, north-north-westward of the head of the jetty.

A light is exhibited, at an elevation of 30 feet (9^m1), from the mast of a wreck at the head of the jetty.

Anchorage may be obtained off Kampung Beo, in a depth of about 38 fathoms (69^m5), but the bottom is very steep, and the anchorage is open to the wind and sea from south-west, through west, to north-west. Vessels are recommended to approach this anchorage on the line of the prolongation of the jetty and the road ascending behind it. It is preferable, however, to anchor about one mile north-westward of the jetty, where the depths are less and the bottom not so steep.

Provisions in small quantities can be obtained at Kampung Beo.

Chart 2575.

Anchorage may also be found in Baai van Tarohan situated southward of Rede Beo.

Chart 2193, plan of Arangkaa anchorage.

Baai van Arangkaa.—Anchorage.—This bay is entered between a point situated about $2\frac{1}{2}$ miles south-eastward of Tandjung Masareh, which lies 4 miles eastward of Tandjung Ambora (*Lat. $4^{\circ} 34'$ N., Long. $126^{\circ} 48'$ E.*), and Tandjung Anderuwo, about $1\frac{1}{2}$ miles farther south-eastward. Pulu Nusa lies on the coastal reef close northward of the north-western entrance point.

Good anchorage may be obtained, in a depth of about 16 fathoms, with Pulu Nusa bearing about 326° , just open of the rocky north-western entrance point, and Manginpulo, a conical hill, 428 feet (130^m4) high, situated about $2\frac{1}{2}$ miles west-south-westward of Tandjung Anderuwo, bearing 225° .

Chart 930, plan of Straat Liroeng and Reede Sereh.

Straat Lirung.—Dangers.—Anchorages.—This strait separates the southern end of Karakelong from the north-eastern side of Salebabu. At the south-eastern end of the strait are the islets Saraa Ketjil and Saraa Besar, between which and the coast of Salebabu there is a clear

Charts 943, 1263.

Chart 930, plan of Straat Liroeng and Reede Sereh.

and deep channel about half a mile wide. Napu Mapao, with a depth of $4\frac{1}{2}$ fathoms (7^m8) over it, lies about 2 miles north-westward of Saraa Ketjil, and $5\frac{1}{2}$ - and $4\frac{1}{2}$ -fathom (10^m1 and 8^m7) coral patches lie 5 about $1\frac{1}{2}$ miles west-north-westward and northward of the western extremity of that islet; several shoals, with depths of from $1\frac{1}{2}$ to $5\frac{1}{2}$ fathoms (2^m7 to 10^m1), lie within about $1\frac{1}{2}$ miles east north-eastward and east-south-eastward of the eastern extremity of the same islet. Depths of $1\frac{1}{2}$ fathoms (2^m7) extend from a position on the southern side 10 of Karakelong about $2\frac{1}{2}$ miles north-north-eastward of Saraa Ketjil and a detached shoal, with a depth of $1\frac{1}{2}$ fathoms (2^m7) over it, lies about $2\frac{1}{2}$ miles north-north-eastward of the same islet. There is usually a disturbed sea northward of the northern entrance of the strait, even when it is calm elsewhere.

15 Anchorage may be obtained off Kampung Kiama on the northern side of the strait, where there is always shelter. Landing can be effected at several places on this shore.

Good anchorage may be obtained in Rede Lirung, situated off the north-eastern side of Salebabu, about $1\frac{1}{2}$ miles north-westward of 20 Tandjung Sampo, the eastern extremity of the island, in a depth of about 16 fathoms (29^m3), with the flagstaff in the village bearing 214° .

Provisions can be obtained.

A reef, which dries in patches, extends about $2\frac{1}{2}$ cables west-north-westward from the western extremity of Saraa Besar.

25 The best landing place at Lirung is on the sandy beach near the flagstaff, as it is free from rocks.

The tidal stream in Rede Lirung sets parallel with the coast, and may attain a rate of from 2 to 3 inots.

Chart 2575.

30 **Salebabu.—Anchorages.—Dangers.**—A mountain ridge runs through the entire length of the island, with a number of prominent peaks, Ajambanna, with an elevation of 1,202 feet (366^m4), situated in the middle of the island, being the highest. The only low part of the island is in the vicinity of Kampung Moronge, near the eastern ex- 35 tremity, where it is marshy. The west coast is rocky and steep. All the villages are situated on the east coast. See view facing this page.

Anchorage may be obtained by vessels with local knowledge, in depths of from 22 to 27 fathoms (40^m2 to 49^m4), off Kampung Kalongan on the western side of Salebabu, situated about $1\frac{1}{2}$ miles south-eastward 40 of Tandjung Salonggaka (*Lat. $4^\circ 03' N.$, Long. $126^\circ 37' E.$*), the northern extremity, but it is entirely open to easterly winds. A 16-foot (4^m9) patch lies about $3\frac{1}{2}$ cables westward of the rocky point lying close northward of this village.

Chart 930, plan of Straat Liroeng and Reede Sereh.

45 Anchorage may be obtained in Baai van Sereh, on the western side of Salebabu, about midway between the northern and southern extremities, but the depths are from about 50 to 55 fathoms (91^m4 to 100^m6); a vessel will be completely sheltered during the northerly monsoon.

Chart 930, plan of Reede Salebaboe.

50 Baai van Salebabu, situated on the south-eastern side of Salebabu, about $3\frac{1}{2}$ miles from Tandjung Lalawang, its southern extremity, affords anchorage to small vessels in an inlet much obstructed by reefs, at the head of the bay. Salebabu stands at the head of the inlet.

A $3\frac{1}{2}$ -fathom (5^m9) patch and a rock, with a depth of less than one

Charts 943, 1263.

Chart 930, plan of Reede Salebaboe

fathom (1^m8) over them, lie about $4\frac{1}{2}$ cables eastward and about $2\frac{1}{2}$ cables southward, respectively, of Tandjung Sikata, the northern entrance point of the bay.

Good anchorage may be obtained by vessels with local knowledge 5 outside the inlet, in depths of from 16 to 27 fathoms (29^m3 to 49^m4), with the village bearing about 304° . With easterly and south-easterly winds some shelter is obtained from Kaburuang, and complete shelter during the northerly monsoon.

Chart 2575.

10

Kaburuang.—Anchorage.—This island, separated from the south-eastern end of Salebabu by *Straat Kaburuang*, about $2\frac{1}{2}$ miles wide, has two prominent peaks, Padian, 1,326 feet (404^m1) high, about 4 miles south-eastward of the north-western extremity of the island, and Towoa, 1,576 feet (480^m4) high, about $1\frac{1}{2}$ miles southward of Padian. 15 See view facing page 37. The coast is mostly rocky, interspersed with small sandy beaches. The coastal reef is narrow and steep-to, and the only dangers are a 13-foot (4^m0) patch in *Straat Kaburuang*, about $1\frac{1}{2}$ miles west-south-westward of the northern extremity of the island, and a 10-foot (3^m0) patch, close offshore abreast *Kampung Peret* 20 situated about $1\frac{1}{2}$ miles north-westward of Tandjung Pallo, the southern extremity of the island.

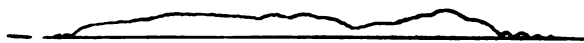
There are no good anchorages, but in calm weather a vessel may obtain anchorage in depths of over 44 fathoms (80^m5), at a distance of more than half a cable from the edge of the reef. 25

A strong stream may set through *Straat Kaburuang*.

Off-lying danger.—Northumberland rif, or *Napu Mbalu*, which stands about 6 miles south-south-eastward of Tandjung Pallo, is a small grassy bank of coral about 5 feet (1^m5) high, surrounded by drying rocks. 30

KAWIO EILANDEN.—Anchorages.—These islands, lying about 60 miles westward of the Talaud eilanden, comprise Marore, Kawio, Kemboling Memanuk, Matutuang, Kawalusu and Dumarche, with the dangers in their vicinity. All the islands are high, and mostly rocky. Marore, Kawio, Kemboling and Kawalusu are inhabited, the remainder 35 are visited temporarily for copra. See view facing page 40.

Marore, the northernmost of the group, has a prominent peak, 457 feet (139^m3) high, on its northern side; when seen from a distance



Marore from eastward.
(Original dated 1931.)

eastward the island appears as two islets. Batu Bawaikang (*Lat.* $4^\circ 45' N.$, *Long.* $125^\circ 29' E.$), consisting of four rocks, the highest of 40 which has an elevation of 116 feet (35^m4), lies close northward of the northern extremity of the island. There is a village, off which a vessel can anchor, on the southern side of the island, but the streams are troublesome here.

Kawio and Kemboling are connected by a reef which dries. Kem- 45 boling is 352 feet (107^m3) high. Anchorage may be obtained on the eastern side of the islands, in a depth of about 30 fathoms (54^m9),

Charts 943, 1263.

Chart 2575.

with the south-eastern point of Kawio bearing 296°, and the north-eastern point of Kemboling, 281°.

Chart 2193, plan of Kawio anchorage.

- 5 Anchorage may be obtained off the western side of the northern end of Kemboling, in a depth of 20 fathoms (36^m6), coral, with the northern extremity of Kemboling bearing 073°, and the south-western extremity, 155°; and in a depth of 15 fathoms (27^m4), coral and coral sand, with the western extremity of Kawio bearing 357°, and the south-western
10 extremity of Kemboling, 164°.

Chart 2575.

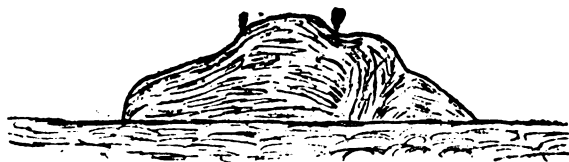
- Marie, or Ehise, is a coral reef, on which there is a sand patch always above water, lying about 10 miles eastward of Kemboling. The size and height of the sand patch changes constantly, according to the wind
15 and stream. Some rocks lie on the north-western side of the reef.

Memasuk, 201 feet (61^m3) high and covered with palm trees, lies on an extensive reef which extends about 4½ miles southward and south-eastward, and is situated about 12 miles east-south-eastward of Kemboling; there are some houses at its south-western end.

- 20 There are very irregular depths in the vicinity of Memasuk. There is a shoal, with a least depth of 6 fathoms (11^m0) over it, situated about 1½ miles eastward of the island, and a shoal, with a least depth of 13 feet (4^m0) over it, about 2 miles southward with a 20-foot (8^m8) patch between the latter and the island. There are strong tidal streams in the
25 vicinity of the island.

- Matutuang, which lies about 10 miles south-south-eastward of Memasuk, is 218 feet (66^m4) high, and is fringed by a reef. Two rocks lie off the north-western extremity of the island, outside the coastal reef. The south-eastern extremity of the island must be given a wide
30 berth as there is shoal water for some distance offshore, and the tidal streams are strong. Anchorage can be obtained on the eastern side of the island in a depth of about 25 fathoms (45^m7).

Kawalusu, about 26 miles south-south-westward of Kemboling, is 933 feet (284^m4) high.



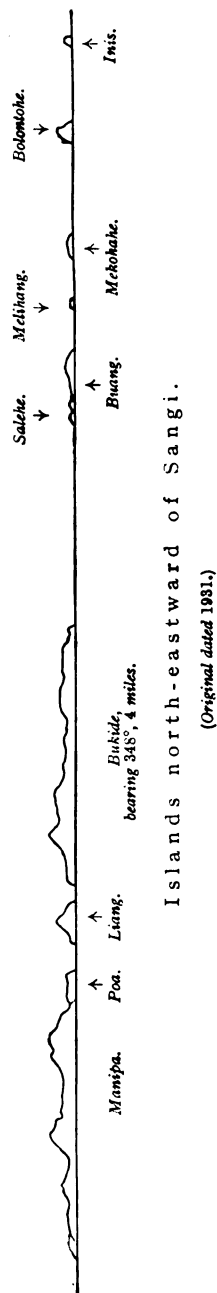
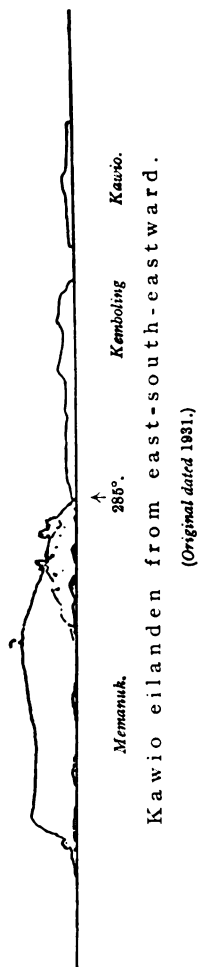
Kawalusu, bearing 100°, 24 miles.
(Original dated 1922.)

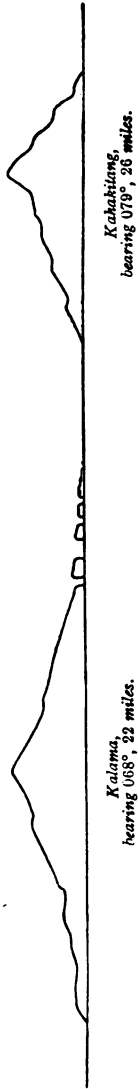
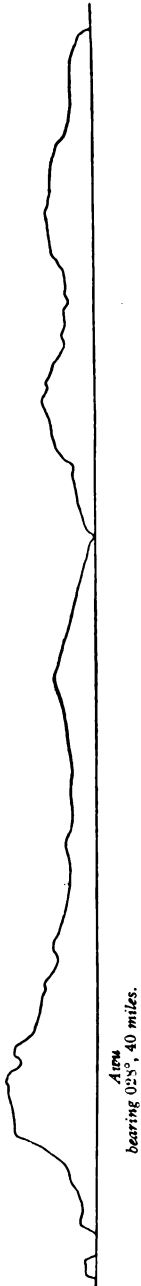
- 35 Dumarche, which lies about 12 miles southward of Matutuang, is an inhospitable rock, devoid of vegetation, 145 feet (44^m2) high. Anchorage may be obtained, in a depth of about 38 fathoms (69^m5), southward of the island, but there may be a strong tidal stream.

- A bank, with a least depth of about 10 fathoms (18^m3) over it, lies
40 about 6 miles south-south-eastward of Dumarche (*Lat. 4° 14' N., Long. 125° 42' E.*), and a shoal, with a least depth of 33 feet (10^m1) over it, coral, lies about 10 miles south-south-eastward of the same island.

Louise rif, known as Napo Taroare by the inhabitants of Marore, situated about 11 miles southward of Kawalusu, has a least depth of

Charts 943, 1263.





Kakatiang,
bearing 079° , 26 miles.



Three views of Sangi eilanden from west-south-westward.
(Original dated 1831.)

Chart 2575.

6 fathoms (11^m0) over it; there is usually a strong stream in this vicinity, and it is advisable to avoid it.

Current.—During the months of October and November, the current between the islands of the Kawio group was observed to set south-south-westward, and varied little from this direction. At the northern end of the group the rate varied from half a knot to 2½ knots. 5

SANGI EILANDEN.—This group includes Sangi, situated about 65 miles west-south-westward of Talaud eilanden, and all the islands as far as, and including, Biaro, about 76 miles southward. They are all 10 thickly wooded, and hilly or mountainous, but low and flat in places on the coasts, and even marshy on Sangi. See views facing pages 41, 48 and 49.

A submarine volcano was reported in 1922 by s.s. *Glengyle* about 76 miles west-north-westward of the north-western end of Sangi. 15

Islands and dangers northward and north-eastward of Sangi.

—**Anchorage.**—Lipang, which lies about 11 miles north-north-westward of Tandjung Tendabalu, the northern extremity of Sangi, is an island with a conical summit, 588 feet (179^m2) high, covered with coconut trees. There is a village on a sandy beach on the western side 20 of the island. A shoal, with a depth of 6½ fathoms (11^m9) over it, lies about 3¾ cables east-north-eastward of the northern extremity. Anchorage may be obtained off the village, but it is deep and the bottom steep, and the tidal streams are irregular. A vessel will lie better northward of the island, but she must anchor farther offshore. 25

About 20 miles eastward of Lipang is Buang, 175 feet (53^m3) high, the northernmost of a chain of islands, covered with coconut trees, extending about 7 miles southward. Salehe is an islet lying close northward of Buang. Bowoné, with a least depth of 13 feet (4^m0) over it, lies about 1½ miles westward of Salehe. Melihang and Mekohahe, 30 situated about 3¼ and 4 miles, respectively, south-south-eastward of Buang, are barren rocks. A 23-foot (7^m0) patch lies about 1½ miles north-westward of Melihang, and there is an above-water rock about one mile northward. There is an extensive reef close southward of Mekohahe. Balontohe, 162 feet (49^m4) high, and Inis, 90 feet (27^m4) 35 high, are steep rocks lying about 2¼ miles south-south-eastward and 3½ miles southward, respectively, of Mekohahe. There are a number of reefs and shoals between and near this chain of islands, and navigation amongst them is unadvisable.

Toade eilanden, consisting of Manipa, Bukide, Liang and Poa, lie 40 about 3 miles off the north-eastern side of Sangi; they are entirely covered with coconut trees. Manipa and Bukide are inhabited. See view facing page 40.

Manipa, the south-western island, is 982 feet (299^m3) high. Kampung Manipa (*Lat.* 3° 45' N., *Long.* 125° 34' E.) is situated on the 45 southern side of the island, off which anchorage may be obtained by vessels with local knowledge, in a depth of about 44 fathoms (80^m5), with the south-eastern extremity of the island bearing 061° and the southern extremity, 264°. The coastal reef, which dries, extends about one cable offshore. 50

Anchorage may be obtained about 2¾ cables south-eastward of the reef which extends from the south-eastern extremity of Bukide, but there is a strong stream here.

Charts 943, 1263.

Chart 2575.

A 15-foot (4^m6) patch lies about 1½ miles east-south-eastward of the eastern extremity of Bukide.

During the months of November and December, a southerly stream, 5 with a rate of from one to 2½ knots, was observed between, and eastward of, Toade eilanden; in some places the direction was variable.

Sangi.—This island, the largest of the group, is mountainous. Near its northern end is Gunung Awu, an active volcano, 4,456 feet (1358^m2) high; earthquakes frequently occur. (See view facing page 10 41). The coast is alternately steep, rocky and low, and marshy in places. Fishing is carried out at night with the aid of torches, so that during the calm months numerous lights may be seen after dark. The climate is healthy.

Northern side of Sangi.—Anchorage.—Between Kampung Kala-15 suga, situated on Tandjung Tendabalu, and Kampung Sawang, close westward of it, the coast is rocky and steep, but eastward and westward of this stretch the land rises gradually inland. Anchorage may be obtained, in depths of from 38 to 27 fathoms (69^m5 to 49^m4), about 1½ cables offshore, off Kampung Sawang, which is not visible from seaward. 20 Landing on the sandy beach is difficult during the northerly monsoon.

Western side of Sangi.—Coast.—Between Tandjung Salimar, situated about one mile westward of Tandjung Tendabalu, and Tandjung Dodah, about 4½ miles south-south-westward, and to about one mile farther southward, the coast is rocky and steep; thence to the 25 entrance of Rede Tahuna, situated about 5½ miles south-eastward, it is steep and rocky in places, but elsewhere rises gradually, with a sand and stony beach; thence to Tandjung Kalehangeng, 1½ miles southward, it is steep and rocky with an occasional coastal reef, which dries.

Chart 930, plan of Baai van Tahoena.

30 **Rede Tahuna.—Light.—Beacons.—Anchorage.**—The limit of this roadstead is an imaginary line joining the entrance points of the bay. (Lat. 3° 37' N., Long. 125° 30' E.).

Tahuna, the capital of the Sangi eilanden, is situated on the northern side of the bay. There is a hospital and resident doctor.

35 A light is exhibited, occasionally, at an elevation of 23 feet (7^m0), from a white iron structure which stands about a mile north-eastward of the southern entrance point of the bay.

Two unofficial leading beacons stand about 7 and 11 cables eastward of the light-structure; the front beacon is surmounted by a white 40 triangle, the rear by a white inverted triangle. These beacons in line, bearing 070°, lead to the anchorage.

There is a small harbour available for praus at high water, situated on the northern side of the bay eastward of the light.

Anchorage may be obtained, in a depth of about 32 fathoms (58^m5) 45 with the light structure bearing 335° and the two beacons bearing 070°. It is usually calm in the bay, but during the northerly monsoon westerly squalls, locally known as "barat," set in suddenly; they are not dangerous for a vessel, but cause much surf on the beach, even at Tahuna; they sometimes occur at other times of the year. Strong 50 south-westerly winds, which are frequent, are shorter in duration and less strong, but can make the working of cargo difficult. Squalls also descend from the 1,703-foot (519^m1) peak situated about 1½ miles eastward of Tandjung Bunakeng, the southern entrance point of the bay.

Charts 943, 1263.

Chart 930, plan of Baai van Manganitoe.

Baai van Manganitu.—Danger.—Anchorage.—This bay, entered between Tandjung Kalehangeng situated about $1\frac{1}{2}$ miles southward of Tandjung Bunakeng (*Lat. $3^{\circ} 37' N.$, Long. $125^{\circ} 28' E.$*), and a point about $1\frac{1}{2}$ miles south-eastward, is backed by hills from about 650 to 820 feet (198^m1 to 249^m9) high, covered with coconut trees.

A $1\frac{1}{2}$ -fathom (2^m3) patch lies three-quarters of a mile southward of Tandjung Kalehangeng, and is frequently well marked by discoloration.

Anchorage may be obtained, in a depth of about 33 fathoms (60^m4), with Tandjung Totone bearing 000° and Bukide, an islet lying on the shore reef at the head of the bay, 090° , but there is the same trouble from squalls as in Rede Tahuna. Sungei Mentuhé flows out about 2 cables eastward of Bukide.

Chart 2575.

Coast.—Anchorages.—Between Baai van Manganitu and Tandjung Sahang, situated about $7\frac{1}{2}$ miles southward, the coast is steep and rocky in most places, and spurs slope down from Sahendaruman, an old volcano.

Anchorage may be obtained by vessels with local knowledge, in a depth of 30 fathoms (54^m9), off Kampung Tamako, in Rede Tamako, situated about $1\frac{1}{2}$ miles northward of Tandjung Sahang. There is a better berth, in a depth of 33 fathoms (60^m4), with the flagstaff in the village bearing 080° . This bay is more exposed to southerly winds than Rede Tahuna, but there is the same inconvenience from squalls.

Charts 2193, plan of Baai van Dago, 2575.

The bight between Tandjung Sahang and Tandjung Toade Manandu situated about $2\frac{1}{2}$ miles south-eastward, is too deep and steep for anchoring. Kampung Kalinda stands at the head of the bight. Tandjung Toade Manandu, the western entrance point of Baai van Dago, is a rocky point, with a rocky islet lying southward of it. A 52-foot (15^m8) patch lies about 4 cables southward of this point.

Mahumu, an island 788 feet (240^m2) high, lies on the eastern side of the entrance to Baai van Dago. Between the island and the south-western side of Sangi there is a channel available for small craft with local knowledge. In the bay it is always calm eastward of Sama, an islet connected to the western shore by a reef and situated about 2 miles north-eastward of Tandjung Toade Manandu. Boats can only land at high water. A narrow channel, with a least depth of 3 feet (0^m9) in the fairway, leads to Kampung Kaluwatu, situated at the head of the bay about $1\frac{1}{2}$ miles east-north-eastward of Sama, but it is only available for vessels with local knowledge. The village is not visible from seaward. There is a church in the village, and a prominent white tomb and a house on the hill are good guides for approaching it. A stone pier extends southward over the shore reef which dries, from Kampung Dago, situated about $3\frac{1}{2}$ cables westward of Kaluwatu.

There is a flagstaff at the root of the pier.

Chart 2575.

Anchorage may be obtained by vessels with local knowledge off Kampung Lapango, situated on the coast of Sangi eastward of Tandjung Buwu, the southern extremity of Mahumu, in a depth of about 30 fathoms (54^m9), about half a cable from the coastal reef, which dries, with the village bearing 052° .

About $1\frac{1}{2}$ miles southward of Tandjung Buwu (*Lat. $3^{\circ} 24' N.$, Long. $125^{\circ} 35' E.$*) is a reef, on which are the islets Dakupang and

Charts 943, 1263.

Chart 2575.

Mendaku, the latter being 257 feet (78^m3) high. A rock, awash, lies about 6 cables westward of Dakupang, and a shoal, with a depth of 6 fathoms (11^m0) over it, lies nearly one mile south-westward of Mendaku.

- Bebalang, an island 428 feet (130^m4) high, with a large round-topped tree on its summit, lies about one mile southward of Mendaku. A 19-foot (5^m8) patch lies about one mile south-eastward of the southern extremity of Bebalang. Anchorage may be obtained by 10 vessels with local knowledge, in a depth of about 44 fathoms (80^m5), about 2½ cables offshore, off Kampung Bebalang, situated on the northern side of the island of the same name, with the north-eastern extremity of the island in line with Tandjung Punguwatu, the southern extremity of Batunderang, bearing 096°, and the village flagstaff, 146°. 15 Batunderang is an island, 611 feet (186^m2) high, separated from the southern extremity of Sangi by a passage, which dries, about a quarter of a cable wide. (*Lat.* 3° 21' N., *Long.* 125° 37' E.).

Tidal streams.—The tidal streams outside the bays off the western side of Sangi set at a rate of about 2 knots.

- 20 **Eastern side of Sangi.—Coast.—Anchorage.**—Between Tandjung Peliang, situated about 6½ miles south-eastward of Tandjung Tendabalu (page 41), and Tandjung Buihase, about 2½ miles farther south-eastward, the land rises gradually from the coast; thence to Tandjung Mahema, the northern extremity of the Lebessan peninsula, 25 about 9½ miles south-eastward, the coast is steep and rocky.

Chart 2193, plan of Taboekan road.

- Anchorage may be obtained, in depths of from 14 to 19 fathoms (25^m6 to 34^m7) off Kampung Tabukan, situated about three-quarters of a mile southward of Tandjung Peliang, but the roadstead is open 30 from north, through east, to south-east. Vessels should anchor with the flagstaff bearing about 236°. The depths of less than 30 fathoms (54^m9) decrease gradually towards the coast.

Chart 2193, plan of Baai van Peta.

- Baai van Peta.—Light.—Beacons.—Anchorage.**—This bay, 35 entered between Tandjung Buihase and a point about 6 cables north-westward affords room for one vessel only and should only be used by vessels not exceeding 390 feet (118^m9) in length. Kampung Peta, at the head of the bay, is the principal settlement on the eastern side of Sangi. The beach here is steep.

- 40 A light is exhibited at the head of the bay, and two leading beacons, each in the form of a cross, stand about 4½ cables apart south-westward of the light structure, and in line bear 222°.

- A beacon surmounted by a white triangle stands on Tandjung Buihase; a similar beacon stands on the western side of the bay about 45 5½ cables north-westward of Tandjung Buihase.

- Anchorage may be obtained, in a depth of about 13 fathoms (23^m8), with the islet situated close off the southern shore about 4 cables west-south-westward of Tandjung Buihase bearing 118° and about 130 feet (39^m6) south-eastward of the leading line. A stern hawser should be 50 taken, quickly, to the shore. Local knowledge is necessary for a vessel over 200 feet (61^m0) in length.

The limit of the roadstead is the arc of an imaginary circle with a radius of 820 feet (250^m0), and the light-structure as centre.

Cargo can be worked at all times.

Charts 943, 1263.

Chart 2575.

Coast.—Anchorages.—Good anchorage may be obtained by vessels with local knowledge in Baai van Sensong, or Sensa, entered between Tandjung Telawai, situated about one mile south-south-eastward of Tandjung Buihase (*Lat. 3° 39' N., Long. 125° 34' E.*), and Tandjung Pananoaleng, about $1\frac{1}{4}$ miles farther in the same direction. The shores are fringed by a reef, which makes landing difficult.

Sarahungu, a rock above water, lies on a reef about one mile southward of Tandjung Lehe, situated about one mile south-south-eastward of Tandjung Pananoaleng, and about half a mile offshore.

Anchorage may be obtained by vessels with local knowledge, in depths of from 30 to 36 fathoms (54^m9 to 65^m8), in Baai van Talengan, or Miulu, entered about 2 miles south-south-westward of Tandjung Lehe. The sea is always calm here. Kampung Talengan, situated in the north-western part of the bay, is difficult to distinguish. Kampung Miulu is situated in the south-western part. Landing is difficult owing to the mangroves, mud and the extensive shore reef.

Chart 2193, plan of Baai van Keeler.

Anchorage may be obtained in Baai van Kulur, entered between Tandjung Wienta, situated about 3 miles southward of Tandjung Lehe, and Tandjung Pako, about half a mile east-south-eastward. Kampung Kulur stands at the head of the bay. Foul ground extends about 6 cables from the head of the bay.

Chart 2193, plan of Baai van Menaloe.

Baai van Menalu.—Dangers.—Anchorage.—This bay is entered between Tandjung Pako and Batu Wingkong, an islet, 421 feet (128^m3) high, which lies about $3\frac{1}{2}$ miles east-south-eastward. The anchorage is approached on either side of Tehang, an island lying about 2 miles eastward of Tandjung Pako. The navigable channel between Tehang and Batu Wingkong is about half a mile wide between the reefs on either side, with a least depth of $4\frac{1}{2}$ fathoms (8^m7) in the middle. During the northerly monsoon there is a heavy swell in this channel and its use during that season is not recommended, but at the anchorage it is nearly always calm.

Batu Malitehang lies near the southern extremity of a detached reef which dries, about 9 cables southward of the southern extremity of Tehang.

In the north-western approach to the bay there is a $4\frac{1}{2}$ -fathom (7^m8) patch lying about 5 cables north-north-westward of Tandjung Kembono, situated $1\frac{1}{2}$ miles south-eastward of Tandjung Pako; and a rock awash, which is usually marked by breakers, lies about 3 cables eastward of Tandjung Kembono.

A vessel should enter the bay with Batu Malitehang in line with a hill, 490 feet (149^m3) high, close within the south-western shore of the bay, bearing 213° , which leads through the entrance in a least depth of 7 fathoms (12^m8) and close north-westward of the $4\frac{1}{2}$ -fathom (8^m7) patch in the fairway. A greater depth may be obtained by keeping the front mark open north-westward of the hill.

Anchorage may be obtained, in depths of from 22 to 27 fathoms (40^m2 to 49^m4), with the 490-foot (149^m3) hill bearing 180° , and a hill, 267 feet (81^m4) high, situated about $6\frac{1}{2}$ cables north-westward, 261° . Working cargo is difficult on account of the sloping beach.

Chart 2575.

Coast.—Anchorage.—Between Tandjung Mahema, the northern

Charts 943, 1263.

Chart 2575

point of Lebessan, and Tandjung Punguwatu, the southern point of Batunderang the coast is high and rocky. There are several deep inlets, but only in Baai van Ngalipaeng, on the southern side of the island, can anchorage be obtained (page 44). Dane or Baneh, a steep rocky islet, with a narrow fringing reef, lies close off the coast of Sangi about $1\frac{1}{4}$ miles southward of Tandjung Behang; the passage between them is available for small vessels with local knowledge except at very low tides. Lenggis, an islet, 359 feet (109^m4) high, lies about half a mile offshore, in the eastern approach to Baai van Ngalipaeng.

A vessel with local knowledge may obtain anchorage off Kampung Salurang, about 3 miles southward of Tandjung Mahema (page 44), in a depth of about 30 fathoms (54^m9), with the white rocks situated northward of Beng Laut bearing 069°, and the south-western extremity of Beng Darat, 124°. During the northerly monsoon landing is difficult owing to the shore reef which dries.

Off-lying islands.—Beng Darat, 441 feet (134^m4) high, lies about $1\frac{1}{4}$ miles north-eastward of Tandjung Behang (*Lat. 3° 27' N., Long. 125° 40' E.*), which is situated about $4\frac{1}{2}$ miles southward of Tandjung Mahema. The island is fringed by a coral reef, on the outer edge of which, about half a mile southward and south-westward of the southern extremity, there is a large patch with a least depth of 20 feet (6^m1). There is a shoal, with a depth of 46 feet (14^m0) over it, in the middle of the passage between the island and the coast of Sangi, marked by whirlpools. The summit of Batu Wingkong in line with the eastern extremity of Lebessan, bearing 346°, leads westward of these dangers. A tidal stream with a rate of 3 knots, has been observed during spring tides in this passage; the stream sets northward during the rising tide and southward during the falling tide, the latter being the stronger.

Beng Laut, a hilly islet, lies about one mile east-north-eastward of Beng Darat, with a clear and deep channel between the reefs, which are marked by discoloration, on either side. Several bare rocks lie within about one mile northward and close eastward of Beng Laut.

Chart 2193, plan of Baai van Ngalipaeng.

Baai van Ngalipaeng.—Anchorage may be obtained in this bay, during the northerly monsoon, in a depth of 47 fathoms (86^m0). Kampung Ngalipaeng is situated at the head of the bay, off which there is a wide shore reef.

Chart 2575.

Karakitang eilanden.—**Anchorage.**—These islands consist of the group lying between Sangi and Siau, situated about 35 miles south-south-westward. Only Kalama, Kahakitang and Para are inhabited.

Kalama, the northernmost island of the group, lying about 10 miles south-westward of Tandjung Punguwatu, is 1,189 feet (362^m4) high. (See view facing page 41). Anchorage may be obtained off the village on the south-western side of Kalama, about $1\frac{1}{4}$ cables offshore, in a depth of about 33 fathoms (60^m4), with the south-western extremity of the island bearing 331°, and the village, 000°. The coastal reef here extends about half a cable offshore; there may be a strong stream at the anchorage.

Kahakitang, 818 feet (249^m3) high, lies $3\frac{1}{2}$ miles south-eastward of Kalama. (See view facing this page). Anchorage may be obtained by vessels with local knowledge, in a depth of about 44 fathoms (80^m5), in Telok Behongang, situated on the northern side of Kahakitang.

Charts 943, 1263.

Chart 2575.

Kampung Behongang is situated at the head of the bay, on the western side. A stone mole, with a wooden head and steps, at the village, with a depth of 6 feet (1^m8) alongside, affords a good landing place. The edges of the shore reef are plainly visible.

5

Mahengetang (*Lat.* 3° 09' N., *Long.* 125° 27' E.), 457 feet (139^m3) high, lies 3 miles south-westward of Kahakitang. There is an islet about half a cable westward and three low rocks about half a mile west-north-westward of Mahengetang; it is reported that a column of water is sometimes thrown up from the sea in this vicinity, where there was an eruption in 1919. There is a village on the northern side of the island and another, with a flagstaff, on the western side.

Anchorage may be obtained by vessels with local knowledge, in a depth of 20 fathoms (36^m6), off the village on the south-western side of Mahengetang, with an islet covered with vegetation on the reef extending from the western extremity, bearing 339°, and the southern extremity of the island, 080°. Tide rips and eddies occur off the southern and western sides of Mahengetang.

Siha, 338 feet (103^m0) high, Salengkere, 293 feet (89^m3), Para, 749 feet (228^m6), and Nitu, 198 feet (60^m3), lie in a group close together about 3 miles south-eastward of Mahengetang. A rock, with a depth of less than 6 feet (1^m8) over it, lies about half a mile southward of the southern extremity of Para. The channel between Siha and Salengkere dries, and that between Salengkere and Para is only navigable by small craft with local knowledge. The channel between Para and Nitu is deep and clear of dangers, but there is a strong stream in it.

A vessel with local knowledge may obtain anchorage off the village on the south-western extremity of Para, in a depth of 38 fathoms (69^m5), about 2 cables offshore, with a rock covered with vegetation close off the western extremity of the island in line with the summit of Salengkere, and the rocky point southward of the village, about 112°. The stream which sets between Para and Nitu passes mainly westward of this anchorage.

Nenung, an islet 162 feet (49^m4) high, lies about 10 miles eastward of the southern extremity of Para. Some rocks, above water, lie within 5 cables northward and 8 cables southward of the islet. A sunken rock lies nearly one mile south-south-eastward of Nenung, and a bank, with a depth of 52 feet (15^m8) over it, coral, lies about 4 miles south-westward of the islet; it is often marked by breakers and tide-rips.

40

Sanggaluhang, 260 feet (79^m2) high, with an islet, 250 feet (76^m2) high, lying on the same reef, close southward of it, lie about 7 miles south-south-westward of Para. Bowondeke, 181 feet (55^m2) high, lies about 1½ miles westward of Sanggaluhang. A 16-foot (4^m9) patch lies about half a mile north-westward of Sanggaluhang.

45

Tidal streams.—Early in February, 1940, between Sanggaluhang and Tahulandang (page 49) an easterly set at a rate of from 1½ to 2½ knots was experienced.

Siau.—Siau, known as Karang Etang by the natives, has a remarkable range of volcanic cones, the northern of which is Gunung Api, or Beludu Awu, an active volcano, 5,992 feet (1826^m4) high; the three cones southward of it are Tamata, which has a double peak, the higher of which has an elevation of 3,718 feet (1133^m3); Begangbalo, also with a double peak, and Tontonbulo, which is connected by a ridge

Charts 943, 1263.

Chart 2575.

close south-westward to Masio. The mountainous land slopes gradually eastward and forms some rocky points northward and southward. Sinapati, a prominent ridge, 779 feet (237^m4) high, is situated on the western side of the island, about 3 miles south-westward of Gunung Api. Tandjung Pihise, the south-eastern point of the island, is low and covered with mangroves. See views facing pages 48 and 49.

The island, which is covered with coconut and nutmeg trees, is densely populated.

10 *Chart 2193, plan of Reede Oeloe.*

Rede Ulu.—Light.—Anchorage.—Rede Ulu is situated off Kampung Ulu, on the eastern side of Siau about 3 miles southward of Gunung Api (*Lat.* 2° 48' N., *Long.* 125° 25' E.).

There is a pier at the village, from the head of which a light is occasionally exhibited.

Anchorage may be obtained, in a depth of 44 fathoms (80^m5), about 1½ cables offshore, with a distinctive white pillar, situated about 3 cables north-eastward of the light-structure, bearing 000°. The bottom is very steep here, and it is advisable to lay out a hawser to the shore. During heavy squalls there is a good berth, in a depth of 26 fathoms (47^m5), with the white pillar bearing 010°, and the flagstaff, 296°, without any hawser to the shore.

From the beginning of January to the middle of April, winds between north-east and east render the roadstead unsafe, so that it is better to anchor during that period, and also in the southerly monsoon, off Kampung Sawang, situated about 3½ miles southward of Ulu, where the bottom is not so steep.

Chart 2575.

Off-lying islands.—Anchorage.—Pahepa, 703 feet (214^m3) high, with a conical summit, lies with Tandjung Pondang, its south-western extremity, nearly one mile south-eastward of Tandjung Pihise. The channel between them is deep and clear of dangers in the fairway; the reefs extending from either side are well marked by discoloration. A stream with a maximum rate of 2½ knots has been observed in this channel, and whirlpools frequently occur. The only anchorage which is sheltered throughout the year is off the small village on the western side of Pahepa.

Gunatin, 916 feet (279^m2) high, is connected to the northern end of Pahepa by a reef, which dries. Kampung Buhias is situated on the south-western side of the island, and on the northern side there is a small bay with a sandy beach. Batu Bolontohe, some rocks covered with vegetation, lie about 2½ cables northward of the northern extremity of Gunatin.

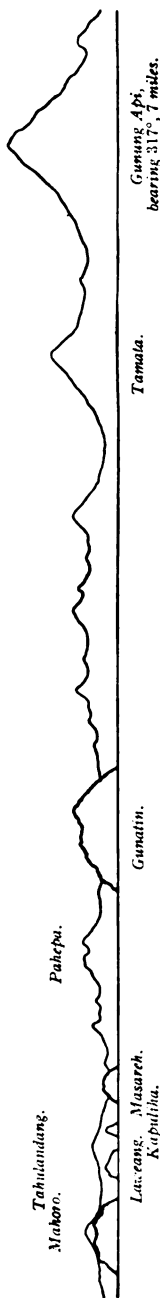
Mahoro, a steep, rocky, uninhabited island, 552 feet (168^m2) high, lies about half a mile eastward of the eastern extremity of Pahepa. A small rock lies close off the north-eastern and south-eastern points of the island.

As there is a coral reef with a least depth of 13 feet (4^m0), over it, at the northern end of the channel between Pahepa and Mahoro, and as the tidal streams set strongly through it, vessels are advised not to use this channel. Masare and Kapuliha are islets 247 and 231 feet (75^m3 and 70^m4) high, respectively, lying on a reef which extends about three-quarters of a mile northward from the eastern extremity of Pahepa. There is a low strip of land covered with coconut trees between the two high rocks of which Masare is formed.

Charts 943, 1263.



Sangi eilanden—Siau from west-north-westward.
(Original dated 1931.)



Sangi eilanden—Siau and islands eastward from south-eastward.
(Original dated 1931.)



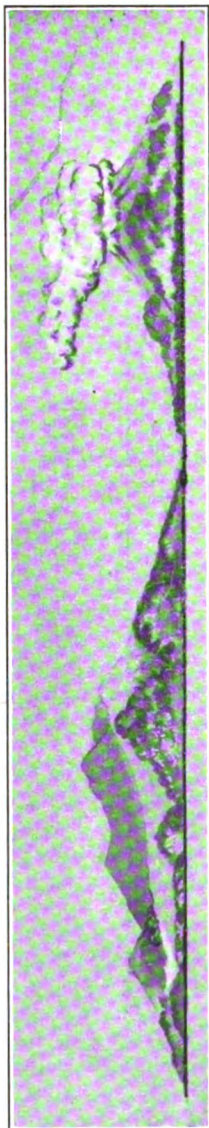
Sangi eilanden.—Biaro from north-eastward.
(Original dated 1931.)



Sangi eilanden.—Biaro from south-south-westward.
(Original dated 1931.)



Sangi eilanden.—Siau.—Gunung Api, bearing 018° , 48 miles.
(Original dated 1916.)



Tahulandang peak,
bearing 095° , 9 miles.
Sangi eilanden.—Tahulandang group from westward.
(Original dated 1916.)



Northern approach to Baai van Menado.
(Original dated 1929.)

Chart 2575.

Laweang, a steep islet, 198 feet (60^m3) high, lies about half a mile southward of the eastern extremity of Pahepa. A coral reef, with a depth of one foot (0^m3) over it, extends about half a mile southward of Laweang; with a heavy swell the rocks may uncover at low water. 5

Makalehi (*Lat.* 2° 44' N., *Long.* 125° 10' E.), an islet 746 feet (227^m4) high, and partly covered with vegetation, lies about 11 miles westward of the western extremity of Siau. A village of the same name is situated in a small bay on the south-western side of the islet; the bay is encumbered with reefs and dries. 10

Tahulandang, Ruang and Pasige.—Tahulandang, situated 15 miles southward of Siau, is the summit of a crater, 2,639 feet (804^m4) high, which is broken on the northern side and forms Baai van Minangan. In the middle of this old crater there is an extinct volcano, which is very steep on all sides. The southern and eastern coasts are 15 very steep; the coastal reef, which extends about three-quarters of a mile from Tandjung Lissa, the western extremity of the island, is only slightly marked by discoloration. The channel between the coastal reefs of Tahulandang and Pasige, situated about 3½ miles westward, is deep and clear of dangers. Tahulandang is inhabited. 20

Pasige is low, covered with mangroves, and uninhabited. The edge of the reef, which dries, which extends as much as 2½ miles north-eastward, is usually marked by breakers, even at high water.

Ruang, which is separated from the south-western side of Tahulandang by a channel about 5½ cables wide, is entirely occupied by Ruang 25 Vulkaan, an active volcano, 2,589 feet (789^m1) high; the summit is on the eastern side of the crater, and is rendered conspicuous on account of some steep rocks which are situated there. From a considerable distance the volcano appears like a mountain with a flat top and steep sides. The last great eruption occurred in 1904. The 30 island is sparsely populated. A coral reef extends a short distance from Tandjung Lempate, the western extremity of the island, but elsewhere there is no coastal reef. *See* view facing this page.

There is a reef, with a depth of 6 feet (1^m8) over it, in the middle of the channel between Ruang and Tahulandang, and as there is also a 35 strong tidal stream vessels are recommended not to use it. The stream sets south-eastward during the rising tide and north-eastward during the falling tide.

Anchorage.—Anchorage may be obtained by vessels with local knowledge off Kampung Minangan, in Baai van Minangan, sheltered 40 during the southerly monsoon and in the transition periods. The depths are great, but as there is little or no shore reef, the shore can be closely approached; squalls do not occur here.

A vessel with local knowledge may obtain anchorage off Kampung Haas, close westward of Tandjung Toka, the southern extremity of 45 Tahulandang, in a depth of 26 fathoms (47^m5), about 2 cables offshore and half a cable from the coastal reef, with Tandjung Meoh, on Biaro, bearing 181°, and the road in the village, 013°. This anchorage is not sheltered and there may be a moderately strong tidal stream.

Chart 2193, plan of Reede Boehias. 50

Rede Buhias.—**Light.**—**Anchorage.**—Rede Buhias is situated off the south-western side of Tahulandang.

A light (*Lat.* 2° 20' N., *Long.* 125° 24' E.) is exhibited from a white stone column standing on a prominent rock of white limestone close

Charts 2575, 943, 1263.

Chart 2193 plan of Reede Boehias

southward of Kampung Buhias, situated about 6 cables north-north-westward of Tandjung Pehe, the south-western point of Tahulandang.

Anchorage may be obtained close off the coastal reef, which is narrow, 5 in a depth of about 44 fathoms (80^m5). A short distance farther north-westward a vessel may obtain anchorage, in a depth of about 38 fathoms (69^m5), farther from the reef; the tidal stream which sets between Tahulandang and Ruang is less felt here. With an unfavourable sea it is better to anchor off the northern side of Ruang, in depths of from 10 27 to 44 fathoms (49^m4 to 80^m5), laying out a hawser to the shore as the bottom rises steeply; there is a depth of over 16 fathoms (29^m3) about half a cable offshore.

Charts 2193, plan of North bay, 940.

Biaro.—Anchorages.—This island, which lies 9½ miles southward 15 of Ruang, has a well defined summit, named Bukide, 1,313 feet (400^m2) high, on its south-eastern side. (See views facing this page). Tandjung Pundusi, the north-western extremity of the island, is low, and off it there is a pillar-shaped rock, 28 feet (8^m5) high. This point should not be approached within 1½ miles, as there is a 3¼-fathom (5^m9) patch 20 lying about 8 cables north-north-westward of the point, and a spit with a depth of 2 fathoms (3^m7) over it, extends about half a mile north-westward from the steep rocky point situated about half a mile west-south-westward of Tandjung Pundusi.

A pillar-shaped rock lies on the reef extending north-north-eastward 25 from Tandjung Meoh, the north-eastern extremity of the island. A ridge, with depths of less than 22 fathoms (40^m2) over it, extends about 1½ miles northward from this point, and strong tidal streams may set over it. The eastern side of the island is steep, but there are some dangers lying close offshore, so that it is advisable not to approach it 30 within a distance of about half a mile.

Anchorage may be obtained by vessels with local knowledge in the bay which lies on the northern side of Biaro, about 2½ cables from the shore reef. The only danger in the bay is a 2½-fathom (4^m6) patch about 2 cables from the shore reef at the head. Caution should be 35 exercised when approaching the anchorage, as the depths decrease suddenly, and the shore reef is not visible at high water in a calm sea. (*Lat. 2° 08' N., Long. 125° 23' E.*).

A vessel with local knowledge may obtain anchorage, in a depth of about 38 fathoms (69^m5), off Kampung Lamanggo, situated close 40 southward of Tandjung Pundusi, but which is not visible. She should approach the anchorage with Bukide bearing 139°, allowing for the tidal stream, which sets across this course.

Chart 940.**NORTH-EASTERN END OF CELEBES.—Baai van Menado.**

45 — Baai van Menado, entered between Tandjung Pisok, situated about 15 miles south-westward of Noordkaap (North Cape), the northern extremity of Celebes, and Tandjung Kalasei, 8 miles farther south-westward, has considerable depths, except close offshore. The coastal reef extends about 4 cables from Tandjung Pisok and is steep-to; it 50 continues as a narrow fringe along the whole of the bay. See view facing page 49.

Menado rivier, which has its origin in Meer van Tondano, 2,460 feet (749^m8) above sea level, flows out on the eastern side of the bay. The

Charts 943, 1263

Chart 940

river is only navigable by small craft over a short distance, and is dangerous to enter under unfavourable conditions.

Chart 2194, plan of Menado road.

Rede Menado.—Lights.—Beacons.—Menado, the largest town 5 in the Minahasa district, stands at the mouth of Menado rivier. The European part, containing the New Amsterdam fort (*Lat. 1° 30' N., Long. 124° 50' E.*), an old stone building surrounded by a moat, is situated on the southern side of the river; the native quarters are mostly on the northern side. In 1936, the population of Menado was 10 about 40,000. There is a basin for praus, with a depth of 3 feet (0^m9), on the southern side of the entrance to the river. A mole extends from both sides of the entrance to the river, from the head of each of which a light is exhibited. The landing place for boats is at the inner end of the basin, where there is a depth of 2 feet (0^m6). 15

The roadstead is never calm, and during December, January, and February, when heavy squalls named “Barat” blow from north-westward, it is often unsafe; during these months high seas and swell prevent communication with the shore, and, unless the vessel is secured to a mooring buoy, steam should be kept up. During the 20 remaining months of the year it is squally, especially in the evenings after the land wind has set in, and during the “Selatan,” or southerly monsoon, although communication with the shore is not interrupted. September and October are the best months. It is extremely rare for the wind to occur without the warning sign of black clouds which 25 envelop Menado Tua, usually about half-an-hour before the wind starts to blow. Two or three hours' warning may be expected if the force of the wind is going to be very severe. The wind is more northerly at Menado and Tondano in January and February than in November and December. 30

There are several foul areas in the roadstead, due to lost anchors and cables, their positions can be seen on the plan.

Vessels should be prepared to leave at short notice, and take shelter in Straat Bangka, or anchor off Kampung Kima in Baai van Wori (page 52). 35

When communication with the shore is broken off, a blue flag will be displayed by day; at night a *red* light will be exhibited under the light at the head of the southern mole.

The climate at Menado is very healthy, and infectious diseases are seldom known; the nights are cool. The annual rainfall averages 40 104 inches; 12 inches or more fall in each month from December to March inclusive, but only between 3 and 4 inches in August and September. The average temperature for the year is 80°; the difference between the average temperature of the hottest and coolest months is only 2°. The temperature has been known to rise to 96° in 45 September and to fall to 64° in July.

A light is exhibited, at an elevation of 39 feet (11^m9), from a white iron framework structure, 39 feet (11^m9) in height, situated on the beach about 3½ cables southward of the head of the southern mole.

A beacon, surmounted by a white ball, stands on the reef lying about 50 2 cables west-north-westward of Tandjung Tokabene, situated about 4½ cables southward of the light-structure on the beach.

Chart 940.

A beacon, surmounted by a triangle painted in red and white hori-

Charts 2575, 943, 942a, 1263.

Chart 940

zontal bands, stands against a coconut tree about 3 cables southward of Tandjung Tokabene.

Chart 2194, plan of Menado road.

- 5 Two leading beacons, each surmounted by a red ball, in line bearing 108° , are situated about three-quarters of a cable northward of the fort. A beacon surmounted by a red diamond, stands on the southern side of the entrance to the river, close southward of a flagstaff. A beacon, surmounted by a white ball, marking the northern limit of the road-
10 stead, is situated about $3\frac{1}{2}$ cables northward of the entrance to the river.

Mooring buoys.—Directions.—There are six mooring buoys to which the stem of a vessel anchored in the roadstead can be secured; four of these buoys lie opposite the town and the other two southward of Tandjung Tokabene. In making use of the buoys, which for
15 convenience sake here are numbered from north to south, the following directions are recommended :—

When approaching No. 1 buoy the anchor should be lowered to about 50 fathoms (91^m4), proceed until the anchor holds and then haul round. No. 2 buoy should be approached with the anchor lowered to about
20 44 fathoms (80^m5). The stream from the river may sometimes be a hinderance to hauling round.

No. 3 buoy should be approached with the two leading beacons, situated northward of the fort, bearing 108° and then anchor lowered to about 50 fathoms (91^m4).

- 25 No. 4 buoy is reserved for the Government vessel stationed at Menado.

At night, if previous intimation is given in good time to the Harbour Master, a *red* light will be placed on one of the mooring buoys and also on the corresponding landmark.

- 30 **Harbour limits.**—The northern limit of the roadstead is the parallel through the northern beacon, described above, the southern limit is the parallel of a position on the coast situated about $1\frac{1}{2}$ miles south-south-westward of the river entrance.

Wharf.—A wharf, with steps at the seaward end, is situated on the
35 southern side of the entrance to the river; the wharf can be used from three hours before to three hours after high water.

Harbour facilities.—Fresh provisions are obtainable. Drinking water can be delivered alongside by a 100-ton water prau.

There is a harbour doctor and a hospital with a wing for infectious
40 diseases. There are disinfecting appliances.

Menado is connected to the general telegraph system.

Fuel oil can be supplied, in drums, from lighters.

Radio.—There is a radio station at Menado. See page 5.

Climatic tables.—See page 34.

45 **Chart 940.**

Coast.—Anchorages.—The coast between Tandjung Pisok (*Lat.* $1^\circ 34' N.$, *Long.* $124^\circ 48' E.$) and Noordkaap is low and mostly fringed by a narrow reef except in the bight situated about $2\frac{1}{2}$ miles south-westward of Noordkaap, which is almost entirely filled by it. Tumpa,
50 a mountain, 2,139 feet (652^m0) high, stands about $2\frac{1}{2}$ miles eastward of Tandjung Pisok.

Kampung Kima is situated at the head of Baai van Wori, entered about 4 miles north-eastward of Tandjung Pisok. Three reefs, with a depth of 2 fathoms (3^m7) on the north-easternmost and shoalest, lie

Charts 2575, 943, 942a, 1263.

Chart 940

off the entrance to this bay, and are only slightly marked by discoloration. It is reported that the southern extremity of Siladeng, bearing 288°, astern, leads into the bay between the two south-western reefs, in a least depth of 17 fathoms (31^m1).

5

Vessels with local knowledge may obtain anchorage off Kampung Kima, in a depth of about 16 fathoms (29^m3), with a hawser to the shore, sheltered from north-westerly winds by the reefs. Landing can be effected here when this is impracticable at Menado. There is also anchorage inside the reefs, in a depth of 23 fathoms (42^m1), with the western entrance point of the bay bearing 180°. Kampung Wori stands on the southern shore of the bay.

10

Chart 2194, plan of Kora Kora bay.

Kora Kora baai, entered about one mile south-south-westward of Noordkaap, affords well sheltered anchorage, in a depth of about 15 19 fathoms (34^m7). A reef, which dries, extends from both entrance points, leaving a passage about half a cable wide between. A fairly strong tidal stream may set across the entrance.

Chart 940.

Off-lying islands.—Bunakeng, which lies about 2 miles north-20 north-westward of Tandjung Pisok, is low, but rises gradually to a round-topped hill, 358 feet (109^m1) high, in its western part. The island is fringed by a coral reef, which is steep-to, extending about 6 cables southward from its south-western extremity, and westward from its southern point.

25

Menado Tua, which lies about 1½ miles westward of Bunakeng, rises steeply in the form of a truncated cone to an elevation of 2,694 feet (821^m2), and has the appearance of a volcano. *See* view facing page 49. It is fringed by a reef which extends 3 cables from its northern side, but is narrow elsewhere. Siladeng, situated about 1¼ 30 miles eastward of the north-eastern extremity of Bunakeng, is low; there is a white sand beach on its eastern side.

Manterawu, which lies about 4½ miles north-eastward of Menado Tua, is a flat coral island covered with trees, and fringed by a reef which extends about 1¼ miles from its northern side. Nain, situated 35 about 2¼ miles north-eastward of Manterawu, appears saddle-shaped from eastward or westward, the northern summit, which has an elevation of 627 feet (191^m1), being the higher. The island lies in the middle of a coral reef which is steep-to. Nain Ketjil (*Lat.* 1° 47' N., *Long.* 124° 48' E.), 112 feet (34^m1) high, lies on the same reef about 40 half a mile eastward of Nain.

All the above mentioned islands are planted with coconut trees. The channels between these islands are deep and clear of dangers in the fairway.

Chart 930, plan of Straat Bangka.

45

STRAAT BANGKA. — **Dangers.** — **Light.** — Straat Bangka lies between the north-eastern coast of Celebes between Noordkaap and Tandjung Pusan, 12 miles east-south-eastward, on the south, and a group of islands, of which Bangka, Talisei and Gangga are the principal, on the north. The depths throughout the strait are irregular, the 50 water is so clear that the bottom can be seen in depths of from 8 to 10 fathoms (14^m6 to 18^m3) in a calm sea. The strait is available for vessels of any draught by following the directions given on page 56.

Charts 2575, 943, 942a, 1263.

Chart 930, plan of Straat Bangka.

Noordkaap or Tandjung Torawitan is wedge-shaped when seen from eastward or westward, and rises gradually to the hilly land within. It is fringed by a coral reef, which extends about a quarter of a cable 5 offshore and is steep-to, and on its eastern side there is a beach of white coral sand. Tandjung Bohoi, situated about 2 miles south-eastward of Noordkaap, is a low rounded point, fringed by a reef, which dries.

Lehaga, an islet 106 feet (32^m3) high, lies on the northern side of the strait about 2 miles north-north-eastward of Tandjung Bohoi. 10 Gangga, with its southern end lying about three-quarters of a mile eastward of Lehaga, is 331 feet (100^m9) high at its southern end; its eastern side is steep-to, but its western side is fringed by a reef. A 3½-fathom (5^m9) patch and a 5½-fathom (10^m1) patch lie about 5½ cables eastward and 3½ cables southward, respectively, of the southern 15 point of Gangga. Tindila is an islet separated from the northern extremity of Gangga by a narrow channel only available for boats. The northern part of the islet is rocky, and the southern part terminates in a white sandy beach. A reef extends about 4 cables south-westward from the western side of the islet. Depths of 6 fathoms (11^m0) or less 20 extend about 2 cables north-westward from the northern end of the islet.

Talisei, separated from the northern extremity of Tindila by a deep channel about 2 cables wide, is a densely wooded island, with a ridge which runs almost throughout its length, with its summit, 1,145 feet (349^m0) high near the middle; the southern end of the island is low. 25 Tandjung Arus, the northern extremity, is a bold cliff with some large rocks at its base. Along the western side of the island the fringing reef dries out to about one cable, widening to about 2½ cables off the south-western extremity.

A light is exhibited, at an elevation of 352 feet (107^m3), from a white 30 iron framework structure. 65 feet (19^m8) high, on Tandjung Arus.

All the dangers with depths of less than 4 fathoms (7^m3) over them, which lie southward of a line joining Noordkaap and Tandjung Puisan are described with the anchorage in Rede Likupang on page 55. There are a number of shoals with depths of from 4 to 6 fathoms (7^m3 to 11^m0) 35 over them, in the fairway of the strait, the positions of which may best be seen on the chart.

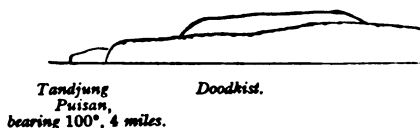
Bangka, the easternmost of the islands on the northern side on Straat Bangka, is hilly and densely wooded, the summit, with an elevation of 1,158 feet (352^m9), being on the eastern side. Tandjung 40 Sahaong (*Lat.* 1° 44' N., *Long.* 125° 09' E.), the southern extremity, is cliffy, and rises to a conical hill, 266 feet (81^m1) high. Sahaong, an islet, and several rocks above water, lie on a reef extending southward from a tongue of land projecting eastward about one mile north-eastward of Tandjung Sahaong, which forms the southern side of Djiko 45 Sago. Tandjung Batu Gosoh, the eastern extremity of Bangka, rises to a sharp conical hill, 263 feet (80^m2) high; some pointed rocks, from 15 to 20 feet (4^m6 to 6^m1) high, lie close off this point, and there are also some rocks above water close off Tandjung Toto, situated about 1½ miles southward. The northern point of Bangka is low and fringed 50 by a coral reef which extends about 2 cables north-westward, with Batu Kapal, 11 feet (3^m4) high, on its extremity. The tidal streams are sometimes strong off this point.

Tandjung Mokotamba, situated 1½ miles westward of the northern extremity of Tandjung Puisan, is a steep and cliffy point wooded to

Charts 2575, 943, 942a, 1263.

Chart 930, plan of Straat Bangka.

the water's edge, with large boulders extending about one cable northward from it, and a shoal about one cable farther. Tandjung Puisan is a high rocky point, rendered unmistakable by a black rock,



North-eastern extremity of Celebes.
(Original dated 1931.)

15 feet (4^m6) high, in the form of a pyramid, connected to it. The land rises steeply within the point to Doodkist, a tableland, 909 feet (277^m1) high, and densely wooded, and can easily be identified by its coffin-like aspect. (Lat. 1° 41' N., Long. 125° 10' E.).

Tidal streams.—The tidal streams in Straat Bangka are semi-diurnal, and attain a rate of from 2 to 3 knots at spring tides. The stream sets westward during the rising tide and eastward during the falling tide. The west-going stream, striking against Tandjung Bohoi, is partly deflected northward, one part setting between Gangga and Lehaga. The east-going stream is joined by a south-east-going stream from between the islands on the northern side of the strait, principally along the western side of Bangka.

With an east-going stream in the strait there is a strong southerly set between the northern extremities of Talisei and Bangka. With a west-going stream in the strait the stream sets north-westward and northward between Talisei and Bangka, as well as along the western coasts of Gangga, Tindila and Talisei; these last two streams unite about 3 miles north-westward of Tandjung Arus, causing heavy tide-rips and eddies.

Local weather.—In July, August, and September the general direction of the wind in Straat Bangka was between south-south-east and south; force 2 to 3 (Beaufort scale) during the day, and light airs and calms at night. A few showers occurred, but there were no really wet days. There was one blow from the southward, force 4 to 6, which lasted 48 hours, and on many days a squall out of Straat Lembeh. The weather was never very clear, except in the early morning, and the tops of the mountains were generally obscured by clouds. In the latter part of August, and in September, the atmosphere became thicker, and during the latter part of September the land was seldom seen at a distance of more than a few miles. The average temperature was 82°.

Chart 930, plan of Reede Likoepang.

Reede Likupang.—**Dangers.**—**Anchorage.**—Reede Likupang, off Kampung Likupang, situated about 4 miles south-south-eastward of Tandjung Bohoi, is well sheltered during the South-east monsoon. The village stands on the western side of the mouth of a rivulet.

Tamperong is a low island lying in a bight on the western side of the roadstead, about 1½ miles southward of Tandjung Bohoi. The reefs in this bight are well marked by discoloration.

A rock, with a depth of about one foot (0^m3) over it, lies about 1½ miles eastward of the northern point of Tamperong.

Charts 2575, 943, 942a, 1263.

Chart 930, plan of Reede Likoepang

A $2\frac{1}{2}$ -fathom (5^m0) patch lies about 2 miles eastward of the northern extremity of Tamperong. Korrier rif, with a depth of $2\frac{1}{2}$ fathoms (5^m0) over it, white coral sand, stone and shells, lies about 2 miles farther eastward and about $1\frac{1}{2}$ miles from the southern shore; it is usually marked by tide-rips. A spit, with depths of less than 5 fathoms (9^m1) over it, extends about 6 cables southward from this reef. A shoal with a least depth of about 4 fathoms (7^m3) over it, lies nearly $1\frac{1}{2}$ miles north-north-westward of Korrier rif.

- 10 Good anchorage may be obtained, in depths of from 6 to 9 fathoms (11^m9 to 16^m5), with the village bearing 200° and Tandjung Bohoi (*Lat.* $1^\circ 44' N.$, *Long.* $125^\circ 01' E.$), 314° . Small vessels can anchor closer in, but care must be taken that the pyramid rock close off the point about $3\frac{1}{2}$ miles westward of Tandjung Puisan is not shut in by the

15 first point eastward of Likupang, as there is foul ground inside it.

Chart 930, plan of Reede Talisei.

Rede Talisei.—Light.—Dangers.—Anchorage.—Buoys.—This roadstead is situated off the south-eastern side of Talisei. Close offshore on the northern side of the roadstead is Kinabahutan, a low wooded island, with a hill about 60 feet (18^m3) high on its south-eastern side. There are depths of over 5 fathoms (9^m1) in the channel between Kinabahutan and Bangka. There is a narrow channel, with depths of 3 fathoms (5^m5) in it, available only for small craft with local knowledge, between Kinabahutan and Talisei.

- 25 There is a stone mole at Talisei from the head of which a light is exhibited, at an elevation of 17 feet (5^m2), from a wooden post. Boats can lie alongside at any state of the tide.

There are mooring buoys in the roadstead.

- A $4\frac{1}{2}$ -fathom (8^m2) patch lies about 3 cables south-eastward of the head of the pier.

A $1\frac{1}{2}$ -fathom (3^m2) patch, with a half-fathom (0^m9) patch close north-north-eastward of it, lies about one cable south-south-eastward of the head of the pier.

- A detached reef, with a depth of three quarters of a fathom (1^m5) over it, lies about $3\frac{1}{2}$ cables westward of the south-western extremity of Kinabahutan.

Anchorage may be obtained, in a depth of about 10 fathoms (18^m3), on the prolongation of the mole, and the western extremity of Kinabahutan bearing 047° .

- 40 *Charts 930, plan of Straat Bangka, 940.*

Directions for Straat Bangka.—A vessel, of deep draught, from westward may pass about a quarter of a mile northward of Noordkaap and then keep that point in line astern with the southern extremity of Nain, bearing 277° , which leads close northward of a 5-fathom (9^m1) patch, situated about $2\frac{1}{2}$ miles westward of Tandjung Sahaong, and close southward of that point.

- COAST.—Anchorage.**—The coast between Tandjung Puisan and the northern entrance of Straat Lembah, situated about 12 miles south-south-eastward, is steep-to, and there is a heavy surf with a northerly or north-easterly swell.

Batu Pandita, close southward of Tandjung Puisan, is 27 feet (8^m2) high, with a white conical summit. Kalinaon, which lies about 3 miles south-south-westward of Batu Pandita, is an islet, 247 feet (75^m3) high,

Charts 2575, 953, 942a, 1263.

Chart 930, plan of Street Banga, 940

covered with vegetation, and joined to the coast by a reef. Mogogimbun is a conical rocky islet, 160 feet (48^m8) high, and covered with vegetation, situated about 2 miles southward of Kalinaon and about three-quarters of a mile offshore. A reef, with two rocks above water on it, extends from the northern side of the islet, and breaks heavily with the slightest sea or swell. 5

Chart 940.

Anchorage may be obtained in the bay westward of Mogogimbun, sheltered from southerly winds, in a depth of 20 fathoms (36^m6), with 10 Mogogimbun bearing 093°, and Batu Pandita, 022°.

Batu Angus is a volcano, 3,718 feet (1133^m3) high, which stands about 3½ miles westward of the western entrance point of the northern end of Straat Lembeh; and on the south-eastern slope of the volcano is another crater, named Batu Angus Baru, in the shape of a truncated 15 cone, and not so densely wooded as the adjacent mountains. Sudara, situated about 2½ miles south-westward of Batu Angus, has a double peak, the higher and western of which is 4,475 feet (1364^m0) high. Kalabat is a well defined cone, 6,631 feet (2021^m1) high, which rises about 8 miles westward of Sudara. 20

Lembeh.—Light.—Lembeh is a sparsely populated, thickly wooded, rocky island, lying with its northern extremity about 11 miles south-eastward of Tandjung Puisan. The northern extremity consists of black and red masses of rocks covered with trees and scrub; close northward of it is Batu Kapal, 82 feet (25^m0) high, and white from 25 guano; rocks extend 2 cables farther northward, the outermost being about 6 feet (1^m8) high. These rocks may be rounded at a distance of about half a mile, but there is usually a strong tide race with whirlpools in the vicinity. The north-eastern extremity of the island is a wedge-shaped rock, about 200 feet (61^m0) high. 30

The east coast is rocky and steep-to, and can be closely approached; some detached rocks, on which there is always surf, lie close off this coast. The south coast is fringed by a fairly wide coral reef, which dries, and is indented by several small inlets. Susulina, about 120 feet (36^m6) high, is a rock lying close off the south-eastern extremity of the 35 island, and Pulu Dua, with two peaks, 309 feet (94^m2) high, lies about 2½ miles west-south-westward of Susulina (*Lat.* 1° 25' N., *Long.* 125° 15' E.).

The south-western extremity of Lembeh is formed by a narrow hilly tongue of land, about 7 cables westward of which there is a small 40 above water sandbank, with a 15-foot (4^m6) patch lying about 3 cables northward of it.

A light, is exhibited, at an elevation of 53 feet (16^m2), from an iron framework structure, painted in black and white horizontal bands, which stands on the sandbank mentioned above. 45

A rock awash lies on the eastern side of the northern entrance to the strait, about 3½ miles south-westward of Batu Kapal. Two small islets lie close south-westward of this rock; the northern islet, which is the lower of the two, in line bearing 203° with a gap in the southern islet, forms a good alignment for clearing the rock. 50

Charts 2194, plan of Lembeh strait, 940.

Straat Lembeh.—Dangers.—Buoys.—Lights.—Tidal streams.—Anchorages.—Straat Lembeh, separating Lembeh from the main island, is narrow and somewhat intricate; in the middle are two islets

Chart 2575, 943, 942a, 1263

Charts 2194, plan of Lembah strait, 940.

fringed by reefs, with a channel on either side, the north-western being the better as it is nearly straight and the reefs are usually plainly visible. A spherical buoy, painted in red and white horizontal bands, with a ball topmark, marks the south-western end of these reefs.

The channel through the strait is marked by black and white chequered conical buoys, but a red can buoy marks a shoal, with a depth of $4\frac{1}{2}$ fathoms (8^m2) over it, which lies on the north-western side of the fairway, about 4 cables west-south-westward of the south-western islet.

A shoal, with a depth of $3\frac{1}{2}$ fathoms (6^m4) over it, which lies near the middle of the channel, about half a mile north-eastward of the north-eastern islet, is marked by a black and white chequered conical buoy.

A rock, about 20 feet (6^m1) high, stands about a cable northward of the north-eastern islet, on the edge of the surrounding reef.

Two shoals, with depths of about 5 feet (1^m5) over them, lie nearly half a mile offshore south-westward of Tandjung Merah, the western entrance point of the south-western end of the strait, so vessels should give this part of the coast a good berth when proceeding to and from Kampung Kema. Kampung Girian stands on the Celebes shore, about 2 miles north-eastward of Tandjung Merah, and a bank of sand and mud, which is steep-to, extends about 3 cables offshore here.

Kampung Bitung (*Lat. $1^\circ 26' N.$, Long. $125^\circ 11' E.$*), where there is a copra godown, stands nearly 4 miles east-north-eastward of Kampung Girian. A wharf, with a planned length of 1,312 feet (399^m9), was under construction, in 1953, at Bitung; in April, 1955, it was reported that a length of about 770 feet (234^m7), with a depth of 34 feet (10^m4) alongside, was available for berthing vessels.

Fresh water is laid on to the piers of the newly constructed harbour. Kampung Aer Tembago, a fishing station, stands about a mile north-eastward of Kampung Bitung, it has a short pier from which an unofficial light is periodically exhibited.

A shoal, with a least depth of $3\frac{1}{2}$ fathoms (6^m9) over it, lies about a quarter of a mile off the south-eastern shore of the strait and $1\frac{1}{2}$ miles eastward of Kampung Bitung; about three-quarters of a mile east-north-eastward and $3\frac{1}{2}$ cables westward of this shoal are two 5-fathom (9^m1) patches, each about 2 cables offshore.

A light, is exhibited, at an elevation of 190 feet (57^m9), from an iron framework structure, painted in black and white horizontal bands, 33 feet (10^m1) in height, which stands on Tandjung Labuan Compenie (Point A) situated on the island of Lembah about half a mile southward of Kampung Bitung.

The tidal streams in Straat Lembah are semi-diurnal, and in the narrowest part attain a rate of from 3 to 4 knots; the stream sets northward with the rising tide, and southward with the falling tide. Southward of the islets in the middle of the strait there is little tidal stream off the Lembah shore, and sometimes there is an eddy. It was reported, in 1950, that during the southerly monsoon a current set in an east-north-easterly direction through Straat Lembah at a rate of about half a knot.

Anchorage may be obtained off the western side of the north-eastern entrance of the strait, in a depth of 20 fathoms (36^m6), with Batu Kapal bearing 056° , and about 2 cables northward of two pillar rocks, about 40 feet (12^m2) high, standing close off the Celebes shore.

Charts 2575, 943, 942a, 1263.

Charts 2194, plan of Lambek Strait, 940

Good sheltered anchorage, in depths of from 17 to 20 fathoms (31^m1 to 36^m6), with no strong tidal streams, may be obtained southward and south-westward of the two islets in the middle of the strait.

Anchorage may be obtained off Kampung Bitung in a depth of about 20 fathoms (36^m6), the shore is steep-to. 5

Chart 930, plan of Reede Kema.

Rede Kema.—Light.—Anchorage.—This roadstead lies off Kampung Kema, situated about 3½ miles south-westward of Tandjung Merah. Kampung Kema stands on a plain at the foot of Kalabat, and 10 can be identified by the numerous coconut trees along the beach, but it is not easily seen from seaward, especially from southward, as the houses are hidden by some high rocks southward of the roadstead. The landmarks easiest to identify are the mosque, the rocky point situated about half a mile southward of the mosque and Batu Nonna, 15 a rock on the coastal reef, which dries, extending from this point.

A light (*Lat.* 1° 21' N., *Long.* 125° 05' E.) is exhibited at an elevation of 24 feet (7^m3), from a white post, on the beach at Kema.

Shoals, with depths of 3½ and 5½ fathoms (5^m9 and 10^m1) over them, lie about 1½ cables eastward and 4½ cables east-north-eastward, 20 respectively, of Batu Nonna and a 3-fathom (5^m5) patch, lies on the northern side of the roadstead, about 3 cables offshore, nearly 1½ miles north-eastward of the landing place.

Good anchorage may be obtained at all times, in depths of from 5 to 11 fathoms (9^m1 to 20^m1); vessels anchoring in a depth of 6 25 fathoms (11^m0) will lie nearly 3 cables offshore. Landing can always be effected on the southern side of the roadstead, even when this is impracticable elsewhere owing to the heavy swell; under favourable conditions the most convenient landing place is at the centre of the village. When conditions are unfavourable for unloading at Menado, 30 goods can be landed at Kema and sent by road.

Chart 2575.

Current.—It has been recorded that between Lembek and the Bentenan eilanden, situated about 30 miles south-westward, the current sets northward along the coast, at the rate of from one to 1½ 35 knots.

Rainfall.—See page 27.

MOLUKKA SEA.—This sea, which separates the north-eastern end of Celebes from the western side of Halmahera, is bounded on the south by Sula eilanden, and is the principal passage for power vessels proceeding between the Celebes, Ceram, Banda and Arafura seas. 40

Local weather.—See pages 23-25.

Tidal streams.—Current.—Tidal streams are only experienced in coastal waters, details of which are given with the description of the coast. 45

For remarks on Current, see page 18.

Islands and dangers.—Except for a few reefs in the immediate vicinity of the various islands no isolated dangers have been found in the Molukka sea. The danger farthest offshore is Wolf rock, described on page 71. 50

Maju, situated about midway between the north-eastern end of Celebes and Halmahera, attains an elevation of 1,353 feet (412^m4) in the middle and slopes gradually to the coast, which is steep-to. During

Charts 2575, 943, 942a, 1263.

Chart 2575

the southerly monsoon, anchorage may be obtained, in a depth of about 22 fathoms (40^m2), off the northern side of the island. There is a village on the western extremity of the island, and the best landing place is 5 eastward of it.

Tifore, situated about 23 miles south-westward of Maju, is 598 feet (182^m3) high, with rocky coasts. Gureda, an islet, 319 feet (97^m2) high, which is connected to the northern side of Tifore by a reef which dries, is a prominent feature. A reef, with a depth of 8 feet (2^m4) over 10 it, marked by discoloration, lies about 2 cables off the middle of the south-western side of Tifore. There is a village on the north-eastern coast of the island.

Current.—See page 18.

Chart 2788.

15 **HALMAHERA.**—The sparse scattered population of this island are of the Alfuren and Papuan types, and to a great extent they dwell on the coast. The northern part of the island is the most populated. Coconut culture and forest produce are the principal means of livelihood; fishing is only carried on in the rivers.

20 Halmahera, though the least important, is by far the largest island of the Noordelijke Molukken, and in general outline is very similar to Celebes, consisting of four long narrow peninsulas, with deep intervening gulfs; it lies at the extreme north of the whole group.

The northern peninsula consists mainly of a mountain range, but its 25 peaks are difficult to identify from a distance, the highest being Silo, which attains an elevation of 3,197 feet (974^m5), about 18 miles south-south-westward of Tandjung Bisoa (*Lat.* 2° 13' N., *Long.* 127° 57' E.), the northern extremity of the island. Posawani, 2,787 feet (849^m5) high, at the northern end of the range, is only prominent from north- 30 ward and southward.

The aspect of the other peninsulas is described with their coasts.

Climate.—The climate on the east coast of Halmahera is such as might be expected along a steep high coast, which nowhere has extensive marshes or mudbanks; it is fresh and healthy.

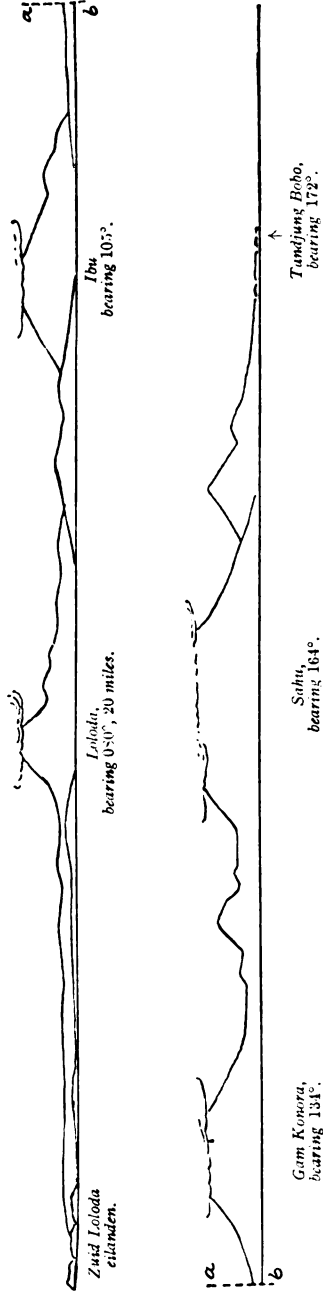
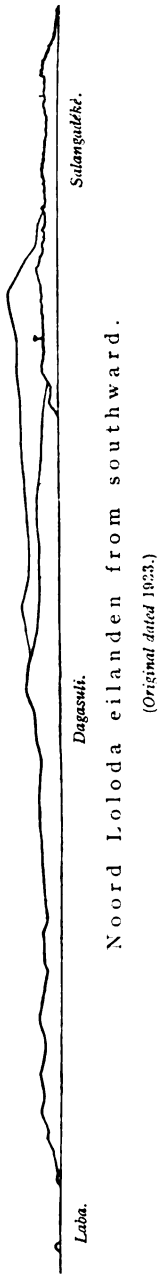
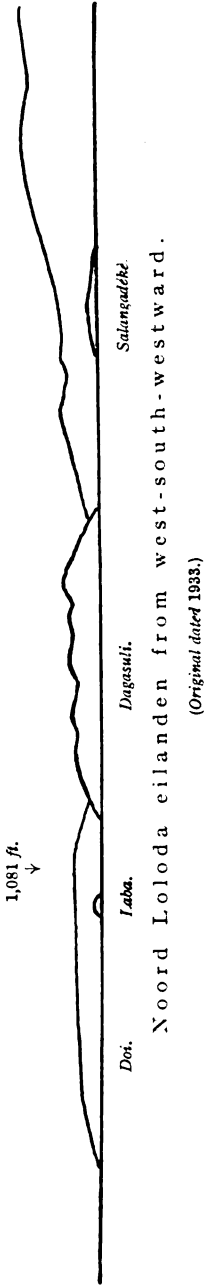
35 *Chart 2786, plan of North Loloda islands.*

Noord Loloda eilanden.—**Anchorage.**—These islands, consisting of Doi, Tuakara, Dagasuli, and Salangadèké, lie westward of the northern end of Halmahera, and are inhabited. (See views facing this page). Doi, the northernmost, lying 8 miles westward of Tandjung Bisoa, is 40 1,081 feet (329^m5) high. Deherete is a group of islets lying about half a mile off the north-western side of Doi. Kampung Dama stands at the head of a small bight on the south-eastern side of Doi, where anchorage may be obtained by vessels with local knowledge, in a depth of about 33 fathoms (60^m4). A reef, with a depth of 10 feet (3^m0) at 45 its outer end, extends about 2½ cables from the western side of the bight.

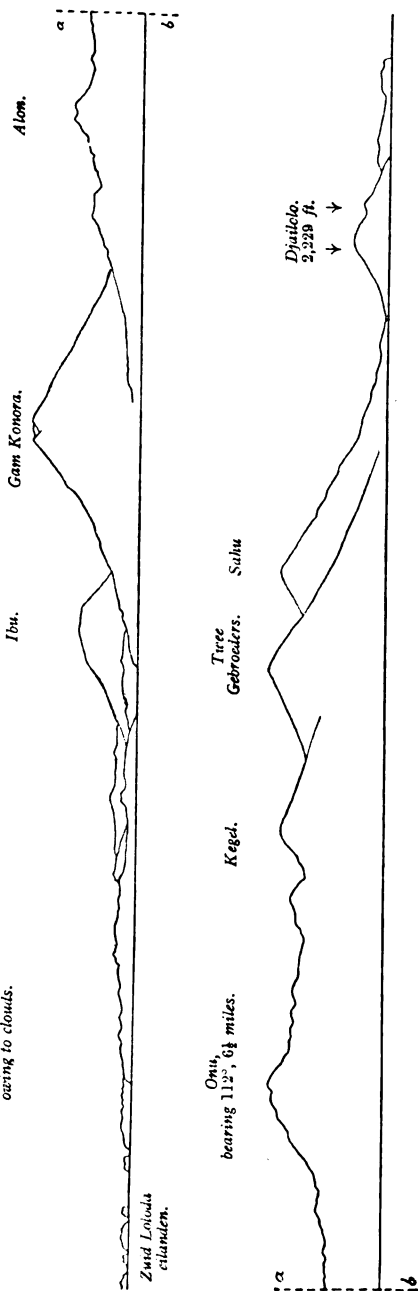
Dagasuli, 630 feet (192^m0) high lies about 2 miles south-south-westward of Doi, with Tuakara about midway between them. Laba or Padosa is an islet lying about three-quarters of a mile north-westward of Tandjung Gurama, the western point of Dagasuli, and a 16-foot (4^m9) 50 patch lies nearly one mile east-north-eastward of the same point.

Salangadèké, on the summit of which there is a small wood, which stands out, is the southernmost island of the group. It is fringed by a drying reef, marked by discoloration, on the northern extremity of

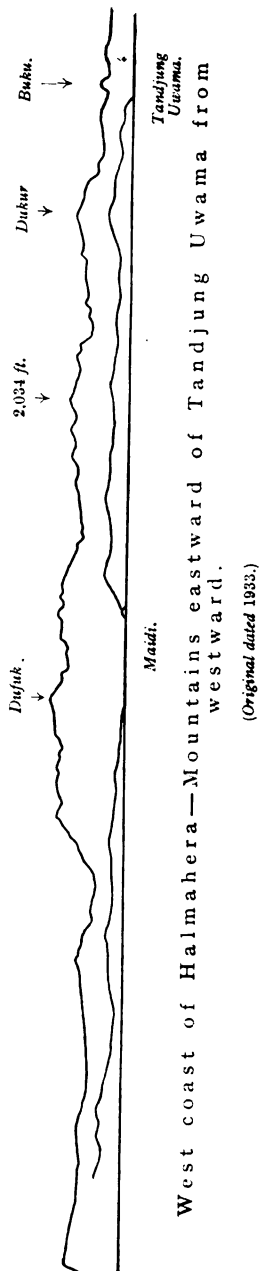
Charts 943, 942a, 1263.



Loloda not visible
owing to clouds.



View, in two parts, of western side of Halmahera.
(Original dated 1933.)



West coast of Halmahera—Mountains eastward of Tandjung Uuama from
westward.

(Original dated 1933.)

Chart 2786, plan of North Loloda islands

which is Tomako ma fatu, a conspicuous rock, covered with vegetation, lying about three-quarters of a mile from the northern extremity of the island. Close within the southern extremity of the reef, which extends about $1\frac{1}{4}$ miles from the southern extremity of the island, is Tuo Tuo, a rock above water, and several others, all covered with vegetation. 5

The channels between the principal islands of the group are clear of dangers in the fairway, except for the 16-foot (4^m9) patch in the middle of the western end of the channel between Tuakara and Dagasuli.

Chart 2788.

10

WESTERN SIDE OF HALMAHERA.—Coast.—Anchorages.—

Tandjung Bisoa slopes gradually from a mountain, 1,228 feet (374^m3) high, situated about $3\frac{1}{4}$ miles southward. From a distance the mountains at the northern end of the peninsula afford less definite landmarks than they do farther south. The coast between Tandjung Bisoa and Tandjung Ruba Ruba, the northern entrance point of Loloda baai, situated about 39 miles south-south-westward, is inhospitable and sparsely inhabited. Bakulu, 1,334 feet (406^m6) high, lies close within the coast about 9 miles north-north-eastward of Tandjung Ruba Ruba (*Lat.* $1^{\circ} 43' N.$, *Long.* $127^{\circ} 33' E.$), and another mountain, 1,074 feet (327^m4) high, lies about 2 miles farther north-north-eastward. A range of mountains, visible from between west and north-west, extends along the east coast of the peninsula southward of Bocht van Galela (page 87). 15

Between the points, which are mostly steep spurs from the mountains, there are narrow sandy beaches, with villages, off which anchorage can usually be obtained by vessels with local knowledge. Landing, however, is difficult. The coast can be followed safely at a short distance, but vessels should keep outside the off-lying islets. Vessels with local knowledge may safely pass inside Sulana, Gorolama and Sogiloga eilanden, lying about one mile offshore westward of Bakulu. 25

Small vessels with local knowledge may obtain a temporary anchorage, in calm weather, in a depth of 19 feet (5^m8), off Kampung Asimiro, situated about 19 miles south-westward of Tandjung Bisoa. A safe anchorage may be obtained, in a depth of 16 fathoms (29^m3), by vessels with local knowledge, in the bay behind Pulu Diti, a coral islet, thickly covered with vegetation, situated about $2\frac{1}{4}$ cables offshore and $2\frac{1}{4}$ miles south-westward of Kampung Asimiro; this islet has a hillock close within its north-eastern and its western extremities. Between Pulu Diti and Zuid Loloda eilanden, which lie about 18 miles south-westward, the only good shelter for small vessels is in Teluk Barataku, situated about 6 miles south-westward of Pulu Diti, in a depth of 41 fathoms (75^m0), behind a drying tongue of reef, on which are the Barataku rotsen, which extend half a mile north-westward from the southern entrance point. Kampung Barataku stands here. 45

Chart 2786, plan of South Loloda islands.

Loloda baai.—Anchorages.—This bay is fronted by the Zuid Loloda eilanden, which consist of Kahatola, 739 feet (225^m2) high, Sidanga and Adui, and several islets, the fringing drying reefs of which are marked by discoloration. The bay is encumbered with dangers, which are less well marked by discoloration in the inner part than they are in the outer part. 50

The double peak of Adui, when seen from seaward from between

Charts 2575, 943, 1263.

Chart 2786, plan of South Loloda islands

Kahatola and Sidanga, appears conical. The outer coasts of Kahatola and Sidanga are mostly steep-to. Moré Porotjo (Porocho), a rock, 332 feet (101^m2) high, close off the north-eastern side of Kahatola, is 5 prominent from north-north-westward. The islands are uninhabited.

Anchorage may be obtained between Dua Séta, a rocky islet covered with coconut trees, situated on the reef close south-westward of Tandjung Ruba Ruba, and Adui, in depths of from 16 to 38 fathoms (29^m3 to 69^m5); good anchorage may be obtained, in a depth of about 10 9 fathoms (16^m5), amongst the outer patches in the bay, with Tjauraga (Chauraga), a rock situated about 2 miles eastward of the northern extremity of Adui, bearing 109°, and with Tandjung Rongi Mhé (*see* below) in line with Komo, a rock, situated about one mile north-north-eastward, bearing 205; the inner part of the bay is not navigable. 15 The passage south-eastward of Adui is encumbered with rocks and is not recommended. The two Tutu eilandjes, situated close off the northern extremity of Kahatola, and Njaolako and Tiro, two rocky islets, lying on the reef fringing the south-western side of Sidanga, are useful marks when approaching from westward.

20 Sungei Loloda flows into the northern side of the bay, but it is only navigable by praus. Kampung Loloda is situated a short distance up the river.

Chart 2788.

Coast.—Anchorages.—Between Tandjung Rongi Mhé, situated 25 4½ miles southward of Tandjung Ruba Ruba and Tandjung Bobo, a high and steep point which lies about 37 miles south-south-westward, the coast is high and too steep to be accessible except in the bights, where it is low and which can be identified by the plains which extend inland from them. The points are remarkable on account of the deso- 30 late mountainous land, which, contrary to the coast farther southward, is volcanic, with still active volcanoes, forming the highest peaks of Halmahera.

About 2½ miles southward of Tandjung Rongi Mhé (*Lat.* 1° 39' N., *Long.* 127° 32' E.) is Kampung Tolufu, situated at the mouth of a 35 rivulet, which flows out in a bight, in which there is a narrow sandy beach. A rock, which dries, lies about half a mile westward of the mouth of the rivulet, and a one-fathom (1^m8) patch lies about three-quarters of a mile southward of the rock. A spur from Loloda, a prominent mountain, 3,587 feet (1093^m3) high, with a rounded 40 summit, situated 7½ miles east-north-eastward of Kampung Tolufu, extends to the coast near the northern bank of the rivulet. There is a small peak on the long southern slope of Loloda. *See* view facing page 60.

Tandjung Ligua ma déhè, situated about 4 miles south-south- 45 westward of Kampung Tolufu, is a high and prominent point, close eastward of which is Pitji, a noticeable rock. Thence to Tandjung Duko, which lies 10 miles southward, the coast is mostly low, except for Ngidi Matjin (Ngidi Ma Chin), a hill, 382 feet (116^m4) high, situated 5½ miles southward. About 6 miles east-north-eastward of 50 Ngidi Matjin is Ibu, 4,535 feet (1382^m3) high, with a crater. From southward and south-westward the eastern crater wall appears as a separate peak; from southward of Zuid Loloda eilanden the western crater appears as a separate peak; on the southern side of Tandjung Ligua ma déhè, Sungei Ibu flows out; it is narrow at its mouth but

Charts 2575, 943, 1263.

Chart 2788.

widens inside and is navigable by large praus. A small rivulet, the Sale, flows into the Ibu at its first bend, and there are several villages on its banks. A sandbank extends from the mouth of the river.

Anchorage may be obtained southward of the mouth of Sungei Ibu, in a depth of $6\frac{1}{2}$ fathoms (11^m9), sand, about three-quarters of a mile offshore, with Tandjung Ligua ma déhè bearing 348° , and Ibu, 092° . Farther southward the depths are less, with a sandy bottom, and farther northward the bottom is rocky. During the West monsoon it is not advisable to anchor closer inshore on account of the swell, which may rise suddenly; during the East monsoon a vessel can anchor from one to $1\frac{1}{2}$ cables closer in, in a depth of 5 fathoms (9^m1). 5 10

There is no landing place at the mouth of Sungei Ibu during the West monsoon, but landing can be effected at the mouth of a small rivulet farther northward, where the beach ceases and where some rocks afford shelter from the north-westerly and westerly swell. Kampung Tobalo is situated on this rivulet, and Kampung Tahafo stands about $1\frac{1}{2}$ miles southward of Sungei Ibu. 15

Sungei Gam Konora flows out about 2 miles southward of Tahafo; it drains the marshy land and the coastal forest, through which a number of creeks flow. Small vessels with local knowledge can approach the river through a channel in the coastal bank, although it is constantly shifting. Anchorage may be obtained, in a depth of 22 fathoms (40^m2), sand, with Tandjung Duko bearing 217° , and the volcano Gam Konora, 157° . 25

Gam Konora, an active volcano, 5,139 feet (1566^m4) high, stands 3 miles eastward of Tandjung Duko (*Lat. $1^\circ 23' N.$, Long. $127^\circ 29' E.$*); close westward of the summit is a distinctive peak, over which smoke continually hangs. Popoldjo, a truncated cone, 2,075 feet (632^m5) high, and Alon, a blunt cone, 2,803 feet (854^m3), are the highest peaks of a ridge which extends northward to the slopes of Gam Konora, lying about $3\frac{1}{4}$ and $4\frac{1}{4}$ miles, respectively, south-south-westward of its summit. Onu, situated about $3\frac{1}{4}$ miles south-westward of Alon, is 3,666 feet (1117^m4) high, and appears conical from westward. Twee Gebruders (Two Brothers), with a double peak, 4,273 feet (1302^m5) high, lies about $3\frac{1}{2}$ miles southward of Onu, and one mile farther south-south-westward is Sahu, 4,122 feet (1256^m4) high, and conical in shape; its summit is often obscured by clouds. Lava beds extend from the foot of Sahu to the coast. See view facing page 61. 30 35

Todahé baai is an inlet with a narrow entrance about 2 miles south-westward of Sahu, and affords a safe shelter to small vessels with local knowledge, off the village of the same name. It is the only good refuge for small craft during the West monsoon between Sungei Ibu and Sidangoli (page 64). The inlet cannot be identified until close to it. 40 45

Good anchorage may be obtained, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), off Kampung Susupu, situated in Sahu baai, about $2\frac{1}{4}$ miles south-south-eastward of Todahé baai. Vessels should not proceed into a depth of less than 11 fathoms (20^m1), as, with westerly winds, even when they are light, there is surf closer in owing to the rapid decrease in the depths. Small vessels find shelter in the heavily sanded up mouth of a small river which flows out southward of the village. The narrow plain within Sahu baai is fertile and thickly populated. 50

Charts 2575, 943, 942a, 1263.

Chart 2786, plan of Approaches to Ternate.

Pulu Salo, or Damar, an islet, lies close offshore, about 2 miles northward of Tandjung Bobo; a reef, which dries, lies close offshore about a quarter of a mile southward of the islet.

- 5 Djailolo (Jailolo), 3,398 feet (1035^m7) high and conical in shape, lies 3 miles north-eastward of Tandjung Bobo; nearly one mile westward of Djailolo is a prominent peak, 2,229 feet (679^m4) high.

Baai van Djailolo (Jailolo bay) is entered between Tandjung Kailupa, situated about 2 miles south-eastward of Tandjung Bobo, and
10 Tandjung Guai, about 3½ miles farther south-eastward. The peninsula, of which Tandjung Guai is the western extremity, can be identified by three hills, from 650 to 820 feet (198^m1 to 249^m9) high, which rise close within. Babua is a rocky islet, 57 feet (17^m4) high, situated about half a mile north-westward of Tandjung Guai. Kampung Djailolo is situated
15 within the northern side of the bay, but it is not visible from seaward.

A shoal, with a depth of 58 feet (17^m7) over it, was reported, in 1952, to lie about 5½ cables south-eastward of the pierhead at Djailolo; its position is approximate.

A vessel approaching Baai van Djailolo from southward should keep
20 Kië Matubu, the summit of Tidore (page 68), astern, bearing about 190° and when nearing Babua should steer for it, keeping it about midway between two remarkable trees standing about half a mile within the northern shore of the bay, bearing about 010°, thence pass westward of Babua, and bring it in line astern with Kië Matubu.

- 25 Kampung Pajo (Payo) stands on the northern side of the inlet northward of Tandjung Kailupa, and can be reached by small vessels with local knowledge through a channel in the reef which dries.

The coast between Tandjung Tauro lamo, about one mile east-south-eastward of Tandjung Gulalo, situated about one mile south-south-
30 eastward of Tandjung Guai and Tandjung Sidangoli (*Lat. 0° 54' N., Long. 127° 29' E.*), about 6 miles southward, is low.

Baai van Tofiri.—Dangers.—This bay, entered between Tandjung Gulalo and Tandjung Ratemu, situated about 4½ miles southward, is encumbered with a number of dangers. Tofiri, a sandbank above
35 water, lies about 2 miles offshore, 2½ miles southward of Tandjung Gulalo. A reef, which dries, and a 19-foot (5^m8) patch lie about 7 and 9 cables, respectively, north-north-eastward of Tofiri. Babua in line with the mountain Djailolo, bearing 338°, leads north-eastward of these dangers.

- 40 Several shoals, with depths of 6 feet (1^m8) and less over them, lie within three-quarters of a mile of the coast.

Coast.—Off-lying danger.—Kampung Sidangoli stands on the northern side of an inlet entered about half a mile south-eastward of Tandjung Sidangoli.

- 45 Pasir Lamo, with a depth of 13 feet (4^m0) over it, and steep-to, lies 2 miles west-south-westward of Tandjung Sidangoli; it is marked by discoloration.

Dodinga baai.—Dangers.—Beacon.—Anchorage.—Dodinga baai is entered between a point situated about 1½ miles south-south-eastward of Tandjung Sidangoli and Tandjung Oba, about 9 miles
50 farther. Kampung Dodinga is situated on the isthmus which connects the head of the bay with Kau baai (page 90), on the eastern side of Halmahera; a horse track leads through a long defile from Kampung Dodinga to Kampung Bobane Igu in Kau baai.

Charts 2788, 2575, 943, 943a, 1263.

Chart 2786, plan of Approaches to Ternate.

A 10-foot (3^m0) patch lies about 1½ miles off the northern shore of the bay just within the entrance, and several reefs, which dry, lie within the same distance of the northern shore about 3½ miles farther eastward.

A shoal, with a least depth of 26 feet (7^m9) over it, lies about 3½ miles north-north-westward of Tandjung Oba. A reef, which dries and is marked by an unofficial beacon, lies 2½ miles northward of Tandjung Oba, and another reef, which dries, lies about one mile east-north-eastward of the beacon. Several reefs, with depths of from 6 to 8 feet (1^m8 to 2^m4) over them, lie about three-quarters of a mile off the south-eastern shore of the bay about 3 miles north-eastward of Tandjung Oba.

Anchorage may be obtained in the inlet off Kampung Dodinga.

Coast.—The coast between Tandjung Oba and Tandjung Dobegasi, a low point which lies about 10½ miles southward, is steep-to. The land between the coast and the mountains within is low. Except for two peaks 1,386 and 2,082 feet (422^m4 and 634^m6) high, about half a miles eastward and one mile east-south-eastward, respectively, of Tandjung Tapatiti, situated 5½ miles southward of Tandjung Oba, the mountain peaks are not very distinctive. The most prominent of the peaks farther inland is one, 2,692 feet (820^m5) high, in the shape of a truncated cone, which stands about 6½ miles eastward of Tandjung Oba.

Off-lying islet and dangers.—Pillongga (Pilongga), a rock, 136 feet (41^m4) high, partly covered with vegetation, lies about 4 miles westward of Tandjung Oba, with a clear channel on either side.

Pasir Radja (Raja) consists of two atolls, which dry, covered with sand and coral dust, the southern of which lies about 3½ miles north-westward of Tandjung Dobegasi (*Lat.* 0° 33' N., *Long.* 127° 31' E.). *Chart 2788.*

Coast.—Anchorages.—Anchorage may be obtained, in a depth of 30 36 fathoms (65^m8), about 2 cables offshore off Kampung Ake lamo, situated about 1½ miles southward of Tandjung Dobegasi.

About 8 miles southward of Tandjung Dobegasi is Tandjung Silahoro, one mile northward and close southward of which is a small inlet, each with a coastal reef, which dries, marked by discoloration, in which small craft with local knowledge may obtain anchorage, in depths of 20 and 15 fathoms (36^m6 and 27^m4), respectively.

About 3½ miles south-eastward of Tandjung Silahoro is Kampung Gita, off which good anchorage may be obtained by vessels with local knowledge, in a depth of 17 fathoms (31^m1), mud, east-north-eastward of the high islet Guratu, the easternmost of the Woda eilanden, which lie westward of the village; Pulu Woda, the northernmost island of the group, is high, but Radja and Tameini, southward of Woda, are low.

Baai van Pajahl.—Dangers.—Baai van Pajahi (Payahi bay) is entered between Tandjung Karokaro, which lies 5 miles south-south-eastward of Tandjung Silahoro, and Tandjung Safi, situated about 8 miles farther south-eastward. Close eastward of Tandjung Karokaro are the three peaks of Karambuku, the westernmost and highest of which has an elevation of 969 feet (295^m3). Close southward of the same point is Djodji (Joji) a high islet, which is a good mark. Tawang, a low islet covered with mangroves, lies on the coastal reef close offshore, nearly one mile eastward of Djodji.

The shores of Baai van Pajahi are bordered by a wide plain, behind which there are a number of peaks, the south-eastern of which is

Charts 2575, 943, 942a, 1263.

Chart 2788.

1,330 feet (405^m3) high. About one mile south-south-eastward of this peak and between which there is a distinct dip, there is a well defined steep slope, which is the northern termination of a mountain ridge, 5 that can be identified from a considerable distance. In favourable conditions the peaks show very plainly against the higher mountains of central Halmahera, especially in the early morning from south-westward and when the plain of Pajahi is covered with thick white mist, as is usual about that time.

- 10 Takat Main Main, consisting of two reefs, with depths of 19 and 13 feet (5^m8 and 4^m0) over them, lie about 3 miles southward of Tandjung Karokaro. Two reefs, with depths of 3 and 6 feet (0^m9 and 1^m8) over them, lie within 1½ miles southward of Tandjung Saselata, a wooded point situated about 2½ miles east-south-eastward of Tandjung 15 Karokaro. A reef, which dries, and a reef, with a depth of 3 feet (0^m9) over it, lie about 1½ miles south-eastward and 2½ miles east-south-eastward of Tandjung Saselata. All these reefs are more or less marked by discoloration.

Kampung Pajahi stands on the north-eastern shore, 3½ miles east- 20 ward of Tandjung Saselata. Southward of the village the hills have been cleared and planted with coconut trees. There is a waterfall about 3 miles southward of the village.

Off-lying danger.—Nassau rif or Takat Lem Lem, with a least depth of 4 feet (1^m2) over it, and marked by discoloration, lies 9 miles 25 south-westward of Tandjung Safi. Tide-rips sometimes occur in this vicinity.

Coast.—Anchorages.—Between Tandjung Gumele, situated about 7 miles southward of Tandjung Safi (*Lat.* 0° 16' N., *Long.* 127° 43' E.), and Tandjung Uwama, about 3 miles farther southward, the coast is 30 mostly bordered with mangroves, varied only at Kampung Maidi by a small beach with coconut trees, off which there is anchorage for vessels with local knowledge, in a depth of about 15 fathoms (27^m4). There are extensive woods behind Kampung Maidi, situated about 1½ miles southward of Tandjung Gumele. Tandjung Uwama rises to an elevation of 35 428 feet (130^m4) about 1½ miles north-eastward.

Tabrain, 2,203 feet (671^m5) high, which stands about 4 miles southward of Tandjung Safi and one mile inland, is easily identified. Sinopa, 2,564 feet (781^m5) high, lies about 3 miles east-north-eastward of Tabrain, and can be identified from south-westward. About 6 miles 40 eastward of Tandjung Gumele is the northernmost of a chain of peaks extending about 5½ miles southward, of which Dufuk, 2,577 feet (785^m5) high, is the highest and is very prominent. Westward of the peaks there is a wide plain. See view facing page 61.

Between Tandjung Uwama and Tandjung Batu Lobang, a prominent 45 rocky cliff, about 5½ miles southward, the coast is mostly bordered with mangroves and coconut trees. A reef, which dries, nearly half a mile southward of Tandjung Uwama, and a reef close offshore about 1½ miles eastward, are easy to distinguish. Anchorage may be obtained by vessels with local knowledge, in a depth of about 16 fathoms (29^m3), 50 off Kampung Lifofa, situated about 2½ miles south-eastward of Tandjung Uwama.

About 2 miles southward of Tandjung Batu Lobang is Kampung Batula, but it is not visible from seaward. Close south-westward of the village there is a flagstaff, a shed with a zinc roof on the beach,

Charts 2788, 942a, 1263.

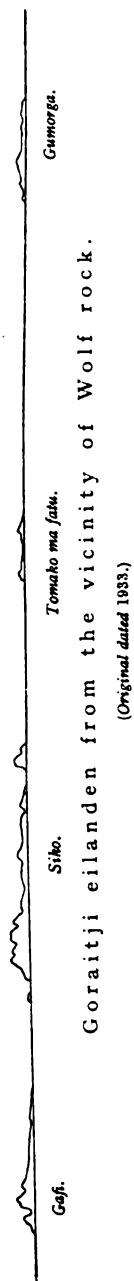
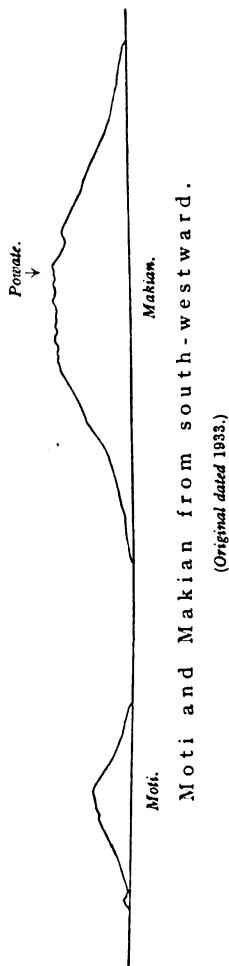
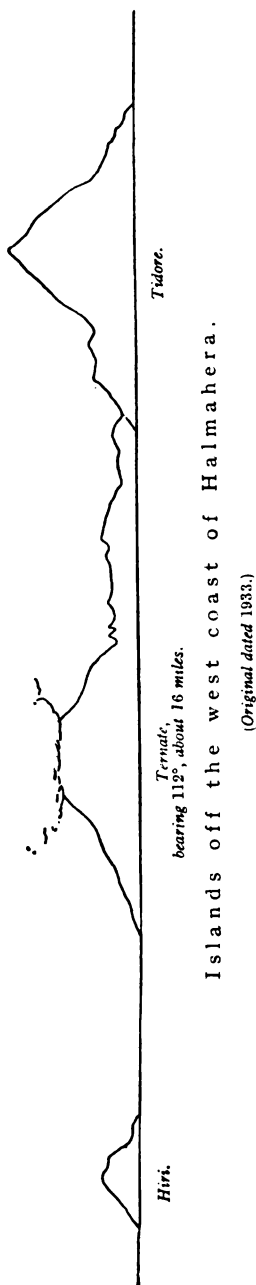


Chart 2788.

and a round-topped tree, southward of the mouth of a river, all of which are easily identified.

Temporary anchorage may be obtained by vessels with local knowledge, in a depth of about 16 fathoms (29^m3), off Batula, in a depth of about 21 fathoms (38^m4), off Kampung Semo, situated about 5 miles southward, and in a depth of about 20 fathoms (36^m6), off Kampung Meloku, about 4½ miles southward of Semo. Between Semo and Meloku there are two prominent peaks, the northern being 1,556 feet (474^m2) high, with a blunt summit, and the other, 1,868 feet (569^m3) high, and conical. Tandjung Tokaka, situated about 2½ miles southward of Meloku, is low, but is rendered distinctive by the village of the same name standing in a coconut plantation close within, and the mouth of a river close northward.

For Straat Patientie, *see* page 78.

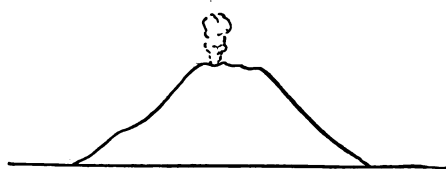
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Chart 2786, plan of Approaches to Ternate.

ISLANDS OFF THE SOUTH-WESTERN SIDE OF HALMAHERA.—Hiri.—This island, situated 9½ miles south-south-westward of Tandjung Bobo (page 62), is 2,246 feet (684^m6) high, and appears as a steep cone from a distance. Maka (*Lat. 0° 55' N., Long. 127° 18' E.*), an islet 202 feet (61^m6) high and some rocks above water, one of which is 60 feet (18^m3) high, and covered with vegetation, lie close westward of the northern extremity of Hiri. *See* view facing this page.

The small bight eastward of the northern extremity of Hiri is recommended as an anchorage for vessels with local knowledge.

Ternate.—This island, lying one mile south-south-eastward of Hiri, is composed almost entirely of a conical volcano, 5,645 feet (1720^m7)



Ternate, bearing 045°, 38 miles.
(Original dated 1833.)

high. *See* view facing this page. This volcano has been in a state of constant activity for more than 300 years, during which period there have been no less than twelve eruptions and violent earthquakes; the most violent during the last century occurred in 1840, and was attended by great loss of property. The more recent eruptions in 1862, 1871 and 1907, were much less severe; the northern half of the island has suffered most.

The coast is fringed by a reef, which extends about a quarter of a mile offshore in places. On the northern side of the island, a bank with depths of less than 6 fathoms (11^m0) over it, marked by discoloration, extends about 3 cables offshore.

Chart 2786, plan of Ternate road.

Rede Ternate.—Lights.—Anchorage.—This roadstead is situated off the town of Ternate, about 2 miles north-eastward of Tandjung Kayu Merah, the south-eastern extremity of the island, and is the principal anchorage off these islands.

Charts 2788, 943, 942a, 1263.

Chart 2786, plan of Ternate Road

The limits of the roadstead are the meridian of $127^{\circ} 23' 23''$ E. and the parallels of $0^{\circ} 47' 42''$ N. and $0^{\circ} 46' 37''$ N.

There are two piers at Ternate, the southern of which, the commercial pier, has a depth of 14 feet (4^m3) at its head, but deepens to 23 feet (7^m0) at a distance of about 30 feet (9^m1) from it; there are no bollards, hawsers are run to dolphins, or, for small vessels, to iron frames inside the ends of the T head; the dolphins should be used with caution as, in 1951, most of them were in bad condition. Owing to the weak construction of the pier, vessels should anchor against the stream, parallel to the pier head, run a stem line to one of the buoys and then make taught with caution. The northern pier is only available for boats, which are liable to be damaged at low water by rocks which nearly dry. There is a cupola and a flagstaff on this pier.

There are a number of mooring buoys situated off the commercial pier, which are used as hauling-off buoys. Vessels running hawsers to the buoys or ashore are recommended to use a power boat on account of the strong stream.

A light (*Lat. $0^{\circ} 47'$ N., Long. $127^{\circ} 23'$ E.*) is exhibited from the head of each pier.

Anchorage may be obtained, in a depth of 15 fathoms (27^m4), with a large house in line with the flagstaff in front of it. Vessels should not anchor closer in as the coastal reef is often difficult to distinguish. From December to April there may be an inconvenient swell in the roadstead.

Ternate.—Beacon.—The town extends for about $1\frac{1}{2}$ miles along the coast, and at Kampung Toboko, situated at its southern end, there is a beacon with a white triangle.

Some radio masts and a church steeple are situated about 2 cables north-north-westward and $2\frac{1}{2}$ cables north-westward, respectively, of the light on the head of the northern pier.

Provisions are scarce. Fresh water is laid on to the commercial pier; about 40 tons can be pumped on board at a rate of 6 tons per hour; it requires chlorination before it is fit to drink. The Harbour Office is near this pier.

Fuel oil is delivered in drums.

There is a resident medical officer, and a hospital with a ward for infectious cases. There are disinfecting appliances.

Ternate is connected to the general telegraph system.

Climate.—The climate is healthy, to which the absence of excessive heat and the fresh sea breeze contribute.

For rainfall, see page 27.

Tidal streams.—Tidal streams set through Rede Ternate at a rate of about $1\frac{1}{2}$ knots. At high water there is a north-going stream, and at low water a south-going stream.

Chart 2786, plan of Approaches to Ternate.

Tidore.—Anchorage.—This island, separated from the south-eastern side of Ternate by Gat van Gamme Lamo, about one mile wide, is of volcanic formation; the southern part of the island consists of a cone, named Piek van Tidore or Kië Matubu, 5,763 feet (1756^m7) high, its summit being bare, and the central part thickly wooded up to a height of about 1,000 feet (304^m8); the slopes are cultivated, especially on the eastern side. The northern half of the island is a rugged mass of hills which slope steeply to the sea, with a few level places near the beach. See view facing this page.

Charts 2788, 943, 942a, 1263.

Chart 2786, plan of Approaches to Ternate.

Gat van Gamme Lamo is deep and clear of dangers in the fairway. A 13-foot (4^m0) patch lies about a quarter of a mile off the southern coast of Ternate. At the south-western end of this channel, with south-westerly winds and a south-west-going stream there is a rough sea. 5

There are several villages in Tidore, the principal being Soa Siu or Tidore, on the south-eastern coast, which can be easily identified on account of its white houses and a large mosque; there is a pier here, with a flagstaff at its head. Anchorage may be obtained, in a depth of 10 about 10 fathoms (18^m3), off Kampung Gam Tofkange, from about 2½ to 5½ cables northward of the pier. Elsewhere anchorage may be obtained anywhere northward of the parallel of Piek van Tidore.

Maitara, an island situated close westward of the northern end of Tidore, is 1,265 feet (385^m7) high, conical, and covered with coconut trees on its eastern side; it is fringed by a reef, marked by discoloration, which extends about a quarter of a mile from its southern side. Only the rocky steep western extremity is inaccessible.

Pillongga, which lies off the coast of Tidore, has been described on page 65. 20

Mare.—Anchorages.—This island, 1,114 feet (339^m7) high, lies 2 miles southward of Tidore, being separated from it by Straat Mare, a deep channel clear of dangers in the fairway. Tandjung Kovo, the southern extremity of the island, is 369 feet (112^m5) high, and connected to the hilly land north-eastward by a low ridge. Kampung Mare is situated on the north-eastern side of the island; there is a small pier here. Anchorage may be obtained off the village, in a depth of 27 fathoms (49^m4), and off Kampung Kovo, close eastward of Tandjung Kovo, in a depth of 31 fathoms (56^m7). 25

Chart 2788.

Moti and Makian.—Anchorages.—These active volcanic islands lie about 5 and 11 miles, respectively, southward of Mare. Both islands are steep-to, but there is a 6-foot (1^m8) patch lying close off the south-eastern side of Moti, which is only slightly marked by discoloration. Moti is 3,213 feet (979^m4) high, its sides being covered with forest to its summit, between which and a lower peak north-eastward there is a remarkable saddle. Makian is 4,683 feet (1427^m4) high and conical; the last eruption in Moti occurred in 1774 and that in Makian in 1940. See view facing this page. 30

The only anchorage off Moti, available for a vessel with local knowledge, is in a depth of 23 fathoms (42^m1), off Kampung Kotta (*Lat.* 0° 29' N., *Long.* 127° 25' E.), situated on the north-eastern side of the island. 40

Chart 2786, plan of Ngofakiaha road.

The only good anchorage in both monsoons is off Ngofakiaha, on the north-eastern side of Makian, in depths of from 16 to 33 fathoms (29^m3 to 60^m4), sand. There is a small boat pier here. If there is too much swell here, landing can always be effected in the small bight southward of Tandjung Rabadaio, situated about half a mile northward. 45

Chart 2788.

Nassau rif, which lies 11 miles south-eastward of Makian, has been described on page 66. 50

Kajoa.—Anchorage.—Kajoa (Kayoa), an island, lying with Tandjung Buku, its north-western extremity, 8½ miles southward of Makian,

Charts 942a, 1263.

Chart 2788.

has a range of mountains, attaining an elevation of 1,491 feet (454^m5) high, running almost throughout its entire length. The coastal reef is well marked by discoloration. Miskin, an islet, 162 feet (49^m4) high, which lies close off the northern extremity of Kajoa, is conspicuous. Pulu Djiré, a rock, 24 feet (7^m3) high, covered with vegetation, lies on the narrow coastal reef close northward of Tandjung Wot Oko, the north-eastern extremity.

Laluin, an island, lies about 2 miles southward of Tandjung Gurua-pin, the south-western extremity of Kajoa, to which it is connected by a reef, which dries in places. A bank, with a depth of 3½ fathoms (6^m9) over it, extends about half a mile southward from Tandjung Waisamola, the southern extremity of Luluin.

Chart 2786, plan of Channel between Kayoa and Luluin islands.

Between the northern end of Luluin and the western side of the southern part of Kajoa, are the islets Toabi Ketjil, Toabi and Gakkutu. A channel, available for small craft with local knowledge, marked by unofficial beacons, leads north-eastward between Kampung Gurua-pin, situated about 6 cables south-eastward of Tandjung Gurua-pin, and the north-western sides of Toabi and Toabi Ketjil. The southern entrance to this channel leads through Lobang Dapoas between the north-eastern side of Luluin and Gakkutu; the fairway is kept by steering for the mosque in Kampung Gurua-pin, bearing 336°, but the reefs on either side are fairly well marked by discoloration.

Anchorage may be obtained in Rede Gurua-pin, southward of Kampung Gurua-pin, where a swell quickly gets up, or in an inner roadstead eastward of it, in a least depth of 29 feet (8^m8). These roadsteads are separated by a channel with a least depth of 8 feet (2^m4) in it.

Chart 2788.

Goraitji ellanden.—Dangers.—Anchorages.—Goraitji (Goraichi) ellanden are a group of wooded islands and islets lying from about 8 to 19 miles westward of Kajoa, extending from Gafi on the north to Taneti on the south. See view facing page 67.

Siko is the north-westernmost and highest of the group, its southern side slopes gradually; its northern and eastern sides consist of rocky cliffs, from about 490 to 818 feet (149^m3 to 249^m3) high. Tomako ma fatu, 306 feet (93^m2) high, lies about 1½ miles south-eastward of Siko. Adu, situated nearly one mile eastward of Gafi, consists of a group of rocks with a sharp summit, and is covered with trees. Tamo Tamo, about 1½ miles south-eastward of Adu, is a bare steep rock with some shrubs on it. On Laigoma, which lies 4½ miles eastward of Siko, there is a horseshoe-shaped ridge of hills, 389 feet (11^m6) high. There is a rock just above water, which breaks heavily in any sea, situated about midway between Tamo Tamo and the south-western extremity of Laigoma. The shoals in the vicinity of Tamo Tamo are only slightly marked by discoloration.

A bank, with a depth of 52 feet (15^m8) over it, lies about 2½ miles southward of Laigoma (*Lat.* 0° 08' N., *Long.* 127° 13' E.).

Gumorga, an island, 470 feet (143^m3) high, lies 5½ miles southward of Laigoma. A shoal, with a depth of 18 feet (5^m5) over it, only slightly marked by discoloration, lies about 9 cables southward of Gumorga.

Tolimao, an island with several peaks, and covered with coconut trees,

Charts 942a, 1263.

Chart 2788.

lies about 3 miles south-south-westward of Gumorga. The edges of the extensive reef, with rocky islets on it, extending eastward from Tolimao, are well marked by discoloration; the detached shoals in the vicinity are sometimes lightly marked. Lilai, which lies about $2\frac{1}{4}$ 5 miles eastward of Tolimao, is 562 feet (171^m3) high, with coconut trees on its summit. Temo ma dafa, situated about one mile southward of Tolimao, is lower than that island, and has a distinctive round-topped tree on its north-western extremity.

Taneti, 766 feet (233^m5) high, lies about 4 miles south-south-eastward 10 of Tolimao. A distinctive tree stands on a hillock on Tandjung Kida, the western extremity of the island. A shoal, with a depth of 31 feet (9^m4) over it, seldom marked by discoloration, lies nearly one mile north-westward of Tandjung Padji (Paji), the northern extremity of Taneti. Except for this shoal, the channel between Taneti and the 15 group of islands, described above, north-north-westward, is clear of dangers in the fairway.

Anchorage may be obtained by vessels with local knowledge in various places in Goraitji eilanden, but the depths are considerable; the holding ground, of greyish green sandy clay, is good. There is a fairly 20 strong stream, dependent on the wind. The best berth in the group is in Rede van Tagono, eastward of the southern extremity of Gumorga, in a depth of 17 fathoms (31^m1), close to the loading place, which is visible from seaward, but it is only suitable for small vessels, being close to the shore. Larger vessels anchor in a depth of 40 fathoms 25 (73^m2), off Kampung Tagono, with the eastern point near Kampung Akedabo (*see* below) bearing 013°, and the point near the cargo shed bearing 337°. (*Lat.* 0° 02' N., *Long.* 127° 14' E.).

The principal villages in Goraitji eilanden lie:—Akedjodjaru, near the south-eastern extremity of Siko; Gafi, on the southern side of the 30 island Gafi; Baru, on the south-eastern side of Laigoma; Tagono and Akedabo, on the south-eastern side of Gumorga; and Buli, on the north-western side of Taneti.

Outlying danger.—Wolf rock, which dries at exceptionally low water, and is steep-to, lies about 12 miles west-north-westward of 35 Siko. It can usually be identified by the breakers on it.

BATJAN EILANDEN. — This group comprises Lata Lata, Kasiruta, Mandioli, and Batjan (Bachan).

Caution.—In the narrow passages between these islands the mariner should never depend on the discoloration for the marking of the reefs; 40 during the strength of the streams the shoals are sometimes marked by strong ripples and whirlpools, on the side opposite to the direction from which the stream is setting. Off the more open parts of the coast the water is very clear during the transition periods between the monsoons, when the bottom can be plainly seen at depths up to about 45 9 fathoms (16^m5); nevertheless, when the sea is very calm, most of the detached reefs are not marked by discoloration. During the strength of the monsoons, both outside the group and within the islands, the water is choppy and discoloration cannot be depended on anywhere.

Tidal streams.—The tidal streams in the Batjan group do not 50 usually exceed a rate of more than 2 knots.

Lata Lata eilanden. — **Off-lying danger.** — **Anchorage.** — These islands, lying about 5 miles south-westward of Taneti, comprise

Charts 942a, 2759a, 1263.

Chart 2788.

Muari, 1,114 feet (339^m6) high, Lata Lata, 1,386 feet (422^m5) high, Pao Besar, 398 feet (121^m3) high, and Pao Ketjil which appears as a cone. Between the first two there is a passage, about 40 yards (36^m6) wide, with a least depth of 6 fathoms (11^m0) in it; and between Pao Besar and Pao Ketjil there is a reef, with a depth of 26 feet (7^m9) in it.

Tolimago (*Lat. 0° 10' S., Long. 127° 11' E.*), a rocky islet, with trees on it, lies midway between Taneti and Muari.

Tuapen, situated about 2½ miles north-westward of Tandjung Idimafala, the northern extremity of Lata Lata, consist of three rocks, 159 feet (48^m5) high. A reef, with a depth of 28 feet (8^m5) over it, lies about one mile southward of the rocks.

The best anchorage for vessels with local knowledge is in the small bay on the eastern side of the northern entrance to the channel between Muari and Lata Lata, in a depth of 27 fathoms (49^m4). Anchorage may also be obtained by vessels with local knowledge off Kampung Gomo in the bay of the same name on the western side of Muari; off Kampung Busua, on the eastern side of Muari, 2 miles southward of Tandjung Hufau, its north-eastern extremity; and in Bobo baai, at the northern end of the western side of Lata Lata.

Kasiruta.—Anchorages.—Kasiruta or Tawali Besar, with its north-western side about 2 miles south-eastward of Muari has two well defined peaks, of which Buku Kabau, a dome-shaped summit, 2,701 feet (823^m3) high, situated in the northern half of the island, is the summit, and close south-westward of it, there is a conical peak, 2,508 feet (764^m4) high. There are two peaks in the midst of hilly land at the south-western extremity of the island, which is separated by a valley, extending in a north-westerly and south-easterly direction, from a ridge along the north-eastern side of Imbu Imbu baai, on which Dufa Dufa, 1,638 feet (499^m3) high, and Tjukur (Chukor) can be identified from south-westward.

The coast is rocky and steep, and there are a number of islets lying close off it. The only detached danger is a 9-foot (2^m7) patch, sometimes well marked by discoloration about 1½ miles eastward of Pao Ketjil.

The western coast of Kasiruta affords several anchorages to vessels with local knowledge, although during the strength of the North-west monsoon there is frequently a high sea with heavy surf in many places.

Mamang baai, near the northern end of the west coast, affords sheltered anchorage in all winds, in a depth of 22 fathoms (40^m2), eastward of an islet lying on the north-eastern side of Djodjok, an island situated on the northern side of the bay. The bay is easily entered by eye between Djodjok and Palele, an island about three-quarters of a mile south-south-eastward of it. Loleo baai, close southward of Tandjung Loleo, situated about 3½ miles south-south-eastward of Tandjung Sengga, the north-western extremity of Kasiruta, is partly sheltered by the Lata Lata eilanden. Kampung Palamea stands on the shore of this bay, about 1½ miles southward of Tandjung Loleo.

Tandjung Besori, situated about 5 miles southward of Tandjung Loleo, is a high steep point separating Lompus baai from Besori baai. In the latter there is a depth of about 21 fathoms (38^m4), and access to it is obtained through a narrow channel clear of dangers between the islets Besori Ketjil and Besori Besar; as the coastal reef extends a

Charts 942a, 2759a, 1263.

Chart 2788.

considerable distance from Besori Ketjil, it is advisable to keep towards the Besori Besar side of the channel. Rain makes the water muddy, the reefs then cannot be seen. There is a village standing on the shore of this bay.

Marikapal eilanden, lying about three-quarters of a mile northward of Tandjung Marikapal, situated about 4 miles southward of Tandjung Besori, and the two rocky islets, Ngai ma dodera, close southward of Tandjung Marikapal are prominent.

Straat Sambaki and northern approach.—Dangers.—This strait separates the eastern side of Kasiruta from the north-western end of Batjan (Bachan.) Pulu Tawali Ketjil (*Lat.* $0^{\circ} 14'S.$, *Long.* $127^{\circ} 18' E.$), a steep rocky islet, 375 feet (114^m3) high, lies about $1\frac{1}{4}$ miles northward of Tandjung Tawali Besar, the north-eastern extremity of Kasiruta. A reef extends about $2\frac{1}{2}$ cables south-westward from the southern extremity of Pulu Tawali Ketjil. Tandjung Tawali Besar is connected to the hilly northern coast of the island by a lower neck of land. Two dome-shaped mountains, 1,615 and 1,350 feet (492^m0 and 411^m5) high, situated on Batjan, about 3 miles south-eastward of Tandjung Batumangara, the north-western extremity of the island, are very prominent.

Toduku, an island 490 feet (149^m3) high, lies in the middle of the northern entrance of the strait, and Salipogot, an islet, lies close off the eastern entrance point, with Poko Poko, a rocky islet close westward of it, leaving a deep channel, about 4 cables wide, between it and Toduku. A 19-foot (5^m8) patch, seldom marked by discoloration, lies about a quarter of a mile northward of Salipogot.

The Kasiruta shore rises steeply, and can be approached closely nearly everywhere. Tandjung Toduku, situated $1\frac{1}{4}$ miles southward of the island of the same name, is easily identified, and there is a bare rocky patch close northward of Tandjung Semo Semo, a moderately high point, situated about 5 miles farther southward. The Batjan shore is moderately low, and is fringed in places by a reef, but rises steeply within. A hill, 464 feet (141^m4) high, which stands about half a mile eastward of Tandjung Bibi, about 4 miles southward of Tandjung Batumangara and Buku Indari, situated $3\frac{1}{2}$ miles farther south-south-westward, are noticeable.

A 19-foot (5^m8) patch lies on the eastern side of the fairway, about $2\frac{3}{4}$ miles southward of Tandjung Batumangara; it is not marked by discoloration.

Pasir Masarang, with a least depth of one foot (0^m3) over it, lies in the fairway about 8 cables south-eastward of Tandjung Supai, situated about $1\frac{1}{4}$ miles southward of Tandjung Toduku.

Two detached reefs, which dry, lie on the eastern side of the fairway about one mile south-westward of Tandjung Bibi.

Chart 2786, plan of Southern approach to Sambaki strait.

Southern approaches to Straat Sambaki.—Dangers.—Beacons.—In the southern approach to Straat Sambaki are the Batu Ampat eilanden, the principal of which are Waring, 356 feet (108^m5) high, Batu Ampat, 540 feet (164^m6), and Tambelik, 622 feet (189^m6); there are many other islands of less elevation, the positions of which may best be seen on the chart. Tuada, the northernmost of the group, is covered with coconut trees, and the others are all wooded. Close eastward of the south-eastern extremity of Waring,

Charts 942a, 2759a, 1263.

Chart 2786, plan of Southern approach to Sambaki strait.

is Tarakian (*Lat. 0° 33' S., Long. 127° 15' E.*), a white rocky islet, which is very prominent.

Straat Sambaki is entered from southward through three channels: 5 on the west is Straat Nanoang, between the south-eastern side of Kasiruta and Batu Ampat; in the middle is Straat Batu Ampat, between Batu Ampat and Tambelik; and on the east is Straat Herberg, between Tambelik and the western side of Batjan.

Straat Nanoang is deep and clear of dangers in the fairway, but a reef, 10 with a depth of 5 feet (1^m5) over it, lies within 3 cables of Tandjung Djere (Jere), on the western side of its southern entrance, and a reef, with a least depth of 15 feet (4^m6) over it, lies within the same distance of the western extremity of Batu Ampat.

Straat Batu Ampat is marked by beacons, and is the channel recom- 15 mended. Two detached reefs, with depths of 5 and 9 feet (1^m5 and 2^m7) over them, the former of which is marked by a beacon surmounted by a white ball, lie on the western side of the fairway, about half a mile northward of the south-eastern extremity of Batu Ampat. A reef, which extends south-westward from the western extremity of Tambelik, 20 is marked by a beacon, surmounted by a black ball. In 1953, the top-mark was missing.

The tidal streams in Straat Batu Ampat and Straat Herberg sometimes attain a rate of 3 knots, but they are not as strong as those in Straat Nanoang.

25 On the western side of the southern entrance to Straat Herberg, connected to the southern extremity of Tambelik by a reef, is Nusa Saga, a wooded islet, a quarter of a mile eastward of which is a shoal, with a depth of one foot (0^m3) over it. Herberg and Meru are islets in the middle of the strait; there is a round-topped tree on the western 30 side of Meru.

Pasir Nondang, a sand patch, which dries, lies close off the coast of Batjan, about 8 cables north-north-eastward of the northern extremity of Tambelik. When covered, some mangroves on it are noticeable. A 26-foot (7^m9) patch lies 4 cables northward of the eastern extremity 35 of Tuada.

Charts 2786, plan of Southern approach to Sambaki strait, 2788.

Directions for Straat Sambaki.—A vessel approaching Straat Sambaki from northward should avoid the two detached reefs, with depths of 13 and 19 feet (4^m0 and 5^m8) over them, lying about a quarter 40 of a mile offshore, close southward of Vuile hoek, situated about half a mile southward of Tandjung Tawali Besar. If approaching from north-eastward, after rounding Tandjung Batumangara, the 19-foot (5^m8) patch northward of Salipogot must be avoided. After passing between Toduku and Poko Poko, the vessel should bring Poko Poko in 45 line with the eastern extremity of Tawali Ketjil (*Lat. 0° 14' S., Long. 127° 18' E.*), bearing 004°, and steer with these marks in line astern, which leads eastward of Pasir Masarang, thence keep in mid-channel to the northern entrance of Straat Batu Ampat or Straat Herberg.

If proceeding through Straat Batu Ampat the vessel should be 50 guided by the beacons.

If proceeding through Straat Herberg she should pass not less than one cable westward of Pasir Nondang, thence westward of Meru and Herberg, thence with the round-topped tree standing on the western side of Meru, bearing 353°, astern, just open westward of Herberg,

Charts 942a, 2759a, 1263.

Chart 2786, plan of southern approach to Sambaki Strait

which leads clear of all dangers to the southern entrance of the strait.

Chart 2788.

Mandioli.—Dangers.—Anchorages.—This island, situated about 5 miles southward of Kasiruta, is high at its northern end, where 5 Buku Gaku attains an elevation of 1,084 feet (330^m4). Tandjung Sarawaki, the north-western extremity, can be identified by an islet of the same name, lying on the drying reef which extends 3 cables westward from the point. A 3-foot (0^m9) patch well marked by discoloration, lies one mile north-north-eastward of this point. 10

Samo, a white bare sandbank on a reef which dries, and Ambatin, an islet with two prominent round-topped trees near its north-western extremity, and chiefly covered with coconut trees, lie about 3½ and 2½ miles, respectively, north-westward of Tandjung Sarawaki. A 26-foot (7^m9) patch lies about 4 cables south-eastward of Ambatin. 15 Pasir Karo, similar to Samo, and a reef which partly dries, about three-quarters of a mile north-north-westward of it, lie about 3 miles west-south-westward and westward, respectively, of Tandjung Sarawaki. A shoal, with a depth of 26 feet (7^m9) over it, well marked by discoloration, lies about half a mile south-south-eastward of Pasir Karo. 20

Several islets and shoals lie off the west coast of Mandioli, the outermost shoal having a depth of 26 feet (7^m9) over it situated about 1½ miles westward of Tandjung Lobi Lobi, which lies 4 miles southward of Tandjung Sarawaki. Ligua, an islet lying close off Tandjung Ligua, situated about 2½ miles south-south-westward of Tandjung Lobi Lobi, 25 is low and covered with vegetation. Gamjaha, with a least depth of 49 feet (14^m9) over it, sometimes marked by discoloration, lies 2½ miles south-westward of Tandjung Ligua.

Kosah baai, entered about 1½ miles south-eastward of Tandjung Sarawaki, and Jojok baai, situated close southward of Tandjung Lobi 30 Lobi, afford anchorage to vessels with local knowledge during the transition periods of the monsoons. In the strength of the monsoons with north-westerly or south-westerly winds, a high sea quickly rises.

The southern coast of Mandioli is low and fringed with mangroves. The south-eastern peninsula has the appearance of a table-top from 35 southward, terminating in Tandjung Mangga, the south-eastern extremity of the island. There are two villages on the shore of Garung Garung baai, situated 5½ and 3½ miles, respectively, westward of Tandjung Mangga. The only anchorage for a vessel with local knowledge off this coast, is in a depth of about 12 fathoms (21^m9), close westward 40 of the western village in Garung Garung baai, but it is dangerous during the southerly monsoon.

The eastern coast of Mandioli, except its northern extremity, is low. In the approach to Indawiwi baai, close southward of Tandjung Buku Gaku (*Lat.* 0° 37' S., *Long.* 127° 16' E.), the north-eastern extremity of 45 the island, is Dajoang, an islet, situated nearly one mile south-eastward of the point, with a 3-fathom (5^m5) patch between, and about one mile farther southward is Ambatu, a high rocky islet, covered with coconut trees, with a reef about three-quarters of a mile west-north-westward of it. The east coast is sparsely inhabited. 50

Good anchorage may be obtained by vessels with local knowledge almost everywhere off the east coast with favourable weather conditions, but in considerable depths in some places.

Current.—A constant northerly current, the wind being light from

Charts 2788, 942a, 2759a, 1263.

Chart 2788.

southward all the time, was experienced by H.M.S. *Flying Fish* in September, 1885, about 25 miles south-westward of Mandioli. In November, 1891, H.M.S. *Penguin* found the current off the west coast of Halmahera setting S. by E. at the rate of $1\frac{1}{2}$ knots. The predominant current is southerly off this coast during the north-west monsoon, see page 19.

Severe tide-rips are experienced, extending to a distance of about 30 miles westward and north-westward of the Obi eilanden.

- 10 **Straat Batjan. — Beacons. — Anchorage.** — Straat Batjan (Bachan strait), between Mandioli and the south-western side of Batjan, is entered at its southern end between Tandjung Mangga and Tandjung Maregarango, situated about 9 miles east-south-eastward. There are four passages between the Obit group of islands leading into
15 the strait from northward, but the three western are seldom used.

The Obit group, of which Obit is the principal island, are low islands, mostly covered with coconut plantations. There is a large tree on Tandjung Batu Ra, the north-western extremity of Obit, and there is a stone landing pier and a prominent mosque at Sangkuangkiano,
20 situated on the north-eastern coast, about one mile south-eastward of Tandjung Paisumbaos, the north-eastern extremity of Obit. Dawora, which lies about $1\frac{1}{2}$ miles eastward of Tandjung Buku Gaku, is wooded. The three islets off the south-western side of Parapotang, the western-most large island of the group, are almost entirely covered with man-
25 groves. On the south-western side of Parapotang there is a village in which there is a prominent zinc chimney.

Straat Udjung Masaran, the eastern passage, is the usual channel taken by vessels proceeding to Labuha from northward. It is clear of dangers in the fairway, the only danger being a 19-foot (5^m8) patch,
30 situated close off the north-eastern side of Obit, about $1\frac{1}{2}$ miles south-eastward of Tandjung Paisumbaos. The edge of the fringing reef on the western side of the strait in the vicinity of this point is marked by a number of unofficial beacons. The usual route through the strait is between Tandjung Paisumbaos and Mambuat, a hilly island, situated
35 about 3 cables north-eastward, thence northward of Nusa Ra, a hilly island, which lies about $1\frac{1}{2}$ miles north-north-eastward of Tandjung Obit, the south-eastern extremity of Obit. There is also a deep and clear channel between Tandjung Obit and Nusa Deket, situated about three-quarters of a mile north-north-eastward.

- 40 Anchorage may be obtained by vessels with local knowledge, in a depth of 22 fathoms (40^m2), out of the influence of the stream, off Kampung Balimbing, situated in Belang Belang baai, on the north-eastern side of Straat Udjung Masaran.

The eastern shore of Straat Batjan, between Tandjung Maregarango
45 (Lat. $0^\circ 50' S.$, Long. $127^\circ 28' E.$) and Labuha, about $11\frac{1}{2}$ miles northward, is low and steep-to, with a few rivulets, villages, and some coconut plantations. Near the southern end the land rises to the massive Sibela gebergte, which attains an elevation of 6,921 feet (2109^m5), about 6 miles north-eastward of Tandjung Maregarango.

- 50 There is a small pier at Penambuan, a settlement situated 8 miles northward of Tandjung Maregarango.

Charts 2786, plan of Labuha road, 2788.

Rede Labuha. — Lights. — Anchorage. — The limits of Rede Labuha are an imaginary line joining Tandjung Obit and Anak Saudara,

Charts 2788, 942a, 2759a, 1263.

Charts 2786, plan of Labuhu road, 2788.

a peak, 1,235 feet (376^m5) high, which stands 5½ miles eastward, and an imaginary line drawn in a 225° direction through Tandjung Masaran, on the north-eastern side of Straat Udjung Masaran.

The Customs pier is at Labuha, and the Government pier is at 5
Kampung Amasing, situated about 2½ cables north-westward.

A light is occasionally exhibited, at an elevation of 7 feet (2^m1), from the head of the Customs pier.

A light is exhibited, at an elevation of 21 feet (6^m4), from a wooden post, 13 feet (4^m0) in height, from the head of the Government pier. 10

There is a distinctive tree standing on the eastern end of Dorapedo, a reef which dries, close off the northern shore, situated 8 cables westward of the Customs pier, and there is a flagstaff about half a cable south-eastward of the Government pier.

Kali Mendawong flows into the sea close southward of two dis- 15
tinctive trees, about one mile southward of the Customs pier.

The best berth for anchoring is in a depth of from 7 to 9 fathoms (12^m8 to 16^m5), soft mud, in the north-eastern part of the roadstead. If there is too much swell, vessels may find shelter in Belang Belang 20
baai.

Labuha.—The town of Labuha is the centre of trade in damar and copra.

The town is connected to the general telegraph system.

Chart 2788.

Batjan.—**Dangers.**—**Anchorage.**—Batjan (Bachan) is generally 25
mountainous. Sibela gebergte (page 76), the highest part of the island, is separated from the high south-eastern peninsula by a well defined depression south-westward of Lapan baai (page 79). Near the middle of this peninsula is Zoutberg or Bibinoi, 3,148 feet (959^m5) high, which has a regular cone. In the middle of the island is Buku Amasing, 3,404 feet 30
(1037^m6) high, which is usually enveloped in clouds, and about 8 miles east-north-eastward of it is Raroang, with an elevation of 3,804 feet (1159^m4), the highest part of a horseshoe-shaped ridge, which appears conical, and is very conspicuous from the southern part of Straat 35
Patientie.

Goro Goro (*Lat.* 0° 25' S., *Long.* 127° 32' E.), which rises about 6½ miles north-north-westward of Raroang, is 2,918 feet (889^m4) high, with a flat summit, and is prominent from the northern end of Straat Patientie. About 3½ miles northward of Goro Goro is a peak, 2,101 feet (640^m4) high, and one mile farther northward is another peak, 1,934 feet 40
(589^m5) high, with a wood on its summit; these two peaks can be identified from the southern part of the strait.

Pasir Balé is a steep-to coral reef, which dries, lying about 6½ miles north-westward of Tandjung Seki, the northern extremity of Batjan.

Baai van Loid, on the northern side of Batjan, affords anchorage for 45
vessels with local knowledge, in a depth of about 15 fathoms (27^m4), off Kampung Geti, situated 1½ miles southward of Tandjung Seki. A shoal, with a depth of 26 feet (7^m9) over it, only slightly marked by discoloration, lies about 1½ miles west-south-westward of the village. About half a mile off the western side of the bay are the islands Nusa 50
Raloid, 589 feet (179^m5) high Nusa Deket, and Babi, 516 feet (157^m3) high. There is a village on Nusa Raloid, and one at the head of the bay.

For the southern side of Batjan, *see* page 80.

Charts 942a, 2759a, 1263.

Chart 2788.

STRAAT PATIENTIE.—Dangers.—Straat Patientie or Kusu Ma Doro, which separates Batjan from the south-western side of Halmahera, is the usual route for vessels plying between Ternate and
5 New Guinea. The northern end of the strait is somewhat obstructed by Kusu eilanden, but there are deep channels between them.

Kusu eilanden, consisting of Saleh Besar, 1,081 feet (329^m5) high, Protjo, Saleh Ketjil, 720 feet (219^m5) high, and Kusu, and several islets, are densely wooded; the eastern half of Kusu is covered with reeds, and
10 Pokal, which lies in the middle of the channel between Saleh Ketjil and Kusu is covered with vegetation. The passages between the islands are clear of dangers; those on either side of Pokal are usually used. Two black rocks, 14 feet (4^m3) high, lie in the passage between Tandjung Manga, the northern extremity of Saleh Besar and Tandjung Semola,
15 on Halmahera; about one mile south-eastward of them is Pulu Djabu, and one mile farther southward are some black rocks lying on the south-western extremity of a reef.

The tidal streams between Kusu eilanden and Pokal may attain a rate of 4½ knots at springs, and 3 knots at neaps, but only for a short
20 period during the latter.

Both shores of Straat Patientie are generally steep-to; the only danger on the eastern side is a 15-foot (4^m6) patch, not marked by discoloration, lying close offshore about 16 miles south-eastward of Tandjung Semola.

25 Between Tandjung Tokaka (page 67) and Tandjung Semola, the eastern shore of the strait is low and covered with coconut plantations, but rises to mountainous land within, of which Uwat Tjain (Chain), 4,142 feet (1262^m5) high, the summit, is easily identified from all directions; Rogi Rogi, which stands about 1½ miles north-westward
30 of Uwat Tjain, has two peaks, 3,748 feet (1142^m4) high; Pasegal, situated about 2½ miles south-eastward of Uwat Tjain, is distinctive from westward and south-westward.

There are three prominent peaks in the vicinity of Tandjung Malabuha (*Lat. 0° 28' S., Long. 127° 54' E.*), situated about 13 miles south-
35 eastward of Tandjung Semola, the highest of which has an elevation of 851 feet (259^m4). Gogosoma, 3,115 feet (949^m2) high, is the southernmost and most distinctive peak of a range extending about 7 miles north-north-westward from abreast Tandjung Buobè, which lies about 13 miles south-south-eastward of Tandjung Malabuha. A reef,
40 well marked by discoloration, extends a short distance from Tandjung Awis, about 10 miles south-eastward of Tandjung Buobè. There are low hills in this vicinity.

On the western side of the strait at its southern entrance, Tandjung Wajatimu, situated 8½ miles west-south-westward of Tandjung Buobè
45 and Tandjung Bilulu or Oosthuk, 4½ miles southward, are easily identified; close within Tandjung Bilulu are two hills, 851 and 933 feet (259^m4 and 284^m4) high.

A shoal, with a least depth of 11 feet (3^m4) over it, lies about 1½ miles south-south-eastward of Tandjung Wajatimu. A 39-foot (11^m9)
50 patch lies about 1½ miles north-north-eastward of Tandjung Bilulu, and a 19-foot (5^m8) patch lies about 1½ miles southward of the same point.

Middelzand (Middle sand), a shoal, with a depth of 7 feet (2^m1) over it, not marked by discoloration, lies about 3½ miles north-eastward of Tandjung Bilulu.

Charts 942a, 2759a, 1263.

Chart 2788.

Anchorage.—Anchorage may be obtained by small vessels with local knowledge, in depths of about 7 fathoms (12^m8), in Gurua Boso, a sheltered inlet on the Halmahera coast, entered about $1\frac{1}{2}$ miles north-westward of Tandjung Semola. The only other anchorage on this coast is off Kampung Saketa, situated in a small bight, about 7 miles east-south-eastward of Tandjung Semola, in a depth of about 13 fathoms (23^m8), sand. 5

Anchorage may be obtained by vessels with local knowledge, in a depth of about 8 fathoms (14^m6), in Rede Sabatang, on the north-eastern side of Batjan, situated about $2\frac{1}{4}$ miles north-westward of Ruige huk, the eastern extremity of the northern part of the island. Kampung Sabatang, in which there is a flagstaff, and south-westward of it a large round-topped tree, stands at the head of the bight. There is a small boat pier here. There is a patch, which dries, close off the village, and a 19-foot (5^m8) patch lies about 2 cables eastward of it ; between them is the recommended anchoring berth. 10 15

See Caution on page 71.

Babang baai, lying on the northern side of Tandjung Sere ma doppio, situated about $10\frac{1}{2}$ miles south-south-westward of Ruige huk, affords anchorage for vessels with local knowledge, in a depth of about 28 fathoms (51^m2), mud, off Kampung Babang. The only danger in the bay is a rock, which dries about 3 feet (0^m9), lying about half a mile eastward of the village. Kali Sajuang flows into the bay about one mile northward of Babang. Sindapa, 1,757 feet (535^m5) high, 25 situated $3\frac{1}{2}$ miles north-westward of Kampung Babang, is prominent from the bay.

Anchorage may be obtained by small vessels with local knowledge in Lapan baai, entered about $2\frac{1}{2}$ miles southward of Tandjung Sere ma doppio, in a depth of about 32 fathoms (58^m5), westward of the mouth of a river. Pulu Gamudja, an islet lying about half a mile off the western shore of the bay near its entrance, is easily identified; the channel between is deep and clear of dangers. There is a prominent yellow patch on the slope of the land in this vicinity, and some hot springs which emit steam and sulphur vapour, which are visible from seaward. There is a small bight close northward in which anchorage may be obtained, in a depth of about 20 fathoms (36^m6). 30 35

Anchorage may be obtained by vessels with local knowledge, in a depth of about 24 fathoms (43^m9), mud and sand, in Teluk Kapal ma loleo, entered close south-westward of the point of the same name, situated about one mile south-westward of Tandjung Bilulu (*Lat.* $0^\circ 47' S.$, *Long.* $127^\circ 54' E.$). 40

Temporary anchorage may be obtained by vessels with local knowledge, in depths of from 13 to 16 fathoms (23^m8 to 29^m3), close off Kampung Gam ma gugu, situated about $2\frac{1}{2}$ miles east-south-eastward of Tandjung Awis. 45

A small vessel with local knowledge may obtain a safe anchorage in Baai van Gane, on the south-western side of Halmahera, about 15 miles east-south-eastward of Tandjung Buobè. The coast of Halmahera on either side of this bay can be safely approached to a distance of one mile. A narrow coastal reef, marked by discoloration, extends from both entrance points. Kampung Gane di dalam is situated just within the western entrance point, and can easily be identified from southward by its large mosque. 50

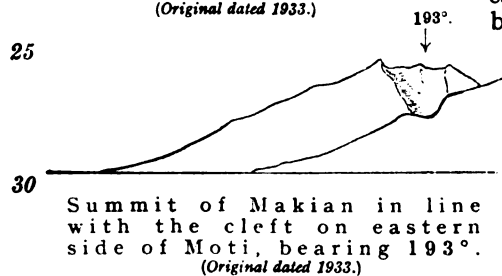
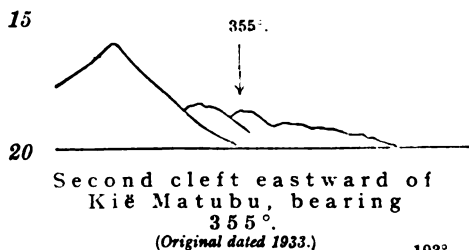
Charts 942a, 2759a, 1263.

Chart 2788.

Anchorage may be obtained, sheltered during the South-east monsoon, in Teluk Boleh Madjiko, entered about 3 miles southward of Baai van Gane. There are low hills in the vicinity of this bay, rising to 5 Tawaigili, a well defined hill, 894 feet (272^m5) high, stands about one mile southward of the head of the bay.

Directions.—A vessel from southward, after passing from 1½ to 2 miles westward of Dowora Lamo (page 81), should steer for Tandjung Buobè, and pass eastward of Middelzand. When abeam of this point, 10 which can be passed at a distance of from one to 2 miles, Saleh Ketjil and Protjo, which lie at the northern entrance of the strait, may be identified, and she can then steer to pass on either side of Pokal.

Thence if proceeding northward to Ternate she should steer for the



eastern extremity of Makian, bearing about 340°, until Moti and Mare are plainly visible, when she should keep the eastern extremity of Mare bearing 344°, open eastward of Moti until the northern extremity of Makian is abeam, when she should steer for the second cleft eastward of Kië Matubu, bearing 355° until the summit of Makian is in line with the cleft on the eastern slope of Moti, bearing 193°, astern, which leads westward of Pasir Radja.

She can then steer to pass on either side of Pillonga, and if passing eastward of it, the eastern extremity of Ternate in line with the

35 small saddle on the northern slope of Hiri, bearing 317°, is a good mark.



STRAAT OBI.—Anchorages.—This strait separates the Obi group (pages 113-117) on the south, from the southern side of Batjan and the islands lying off the southern extremity of Halmahera, on the north.

40 The Sibela gebergte, extending north-eastward from Tandjung Maregarango (Lat. 0° 50' S., Long. 127° 28' E.), the south-western extremity of Batjan, and Zoutberg, near the middle of the south-eastern peninsula of that island, have been described on pages 76 and 77, respectively. Southward of Zoutberg, near the coast there are five

Charts 942a, 2759a, 1263.

Chart 2788.

peaks, from 1,524 to 2,196 feet (464^m5 to 669^m4) high, the highest part of a fairly prominent ridge.

Tandjung Maregarango is low, but is rendered distinctive by a rocky islet, which is steep-to, lying close southward of it.

Anchorage may be obtained by vessels with local knowledge off Kampung Wajaua (Wayaua), situated at the head of Wajaua baai, about 11 miles north-eastward of Tandjung Maregarango. A detached reef, which dries, and well marked by discoloration, lies close off the south-eastern shore about 2 miles south-south-eastward of the village.

Anchorage may be obtained by vessels with local knowledge in Silang baai, entered close northward of Tandjung Silang, situated about 15 miles east-south-eastward of Tandjung Maregarango. Two 6-fathom (11^m0) patches lie within 1½ miles southward of Tandjung Silang, and a shoal with a depth of 8 feet (2^m4) over it, lies about 3 cables offshore and about 1½ miles eastward of the same point. These shoals are scarcely marked by discoloration, although the bottom consists of white sand.

Islands and dangers.—Anchorages.—Dowora eilanden lie on the eastern side of the southern entrance of Straat Patientie. Dowora Lamo, 1,048 feet (319^m4) high, the south-western island of the group, lies about 11 miles east-south-eastward of Tandjung Bilulu (page 78). Dowora Itji, 431 feet (131^m4) high, lies close eastward of Dowora Lamo; each of these islands has a rounded top, and when seen from south-westward Dowora Lamo appears as a saddle. The islets lying north eastward of them are all low. Mano and Waringin, lying about 2½ and 3½ miles, respectively, north-north-eastward of Dowora Itji, each have a distinctive tree on them. The reef, on which these islets lie, dries and is well marked by discoloration; the passage between this reef and the Halmahera coast is deep and clear of dangers. Sori, which lies about 2 miles south-eastward of Dowora Itji, is a low rock covered with vegetation, and surrounded by rocks.

Loleodjaha or Vijf eilanden (Loleojaha or Five islands) consist of a number of islets lying on the edges of two extensive reefs, which dry, and are steep-to, about 9 miles southward of Dowora Lamo; when covered these reefs are well marked by discoloration. The islets are covered with bushes and on the northernmost islet there are some coconut trees.

Woka or Groot Geelmuiden, 352 feet (107^m3) high, lies about 3 miles eastward of the easternmost islet on the southern reef of the Loleodjaha group; it consists of two islets close together on a reef. From most directions it has the appearance of a hat with a flat brim. On the summit of the hill on the eastern islet there are two large trees with white trunks, and on the slopes there are coconut trees and bananas.

Djoronga or Hasselt, situated about 6 miles east-south-eastward of Woka, has two hills 769 and 726 feet (234^m4 and 221^m3) high, in its western part, and is thickly covered with vegetation. The higher and southern of the two hills, seen from southward is flat on top, on which there is a large tree in its centre. There is also a distinctive plume-shaped tree near Kampung Waringin, situated about 1½ miles from Tandjung Domoro ma doto (*Lat.* 1° 08' S., *Long.* 128° 27' E.), the south-eastern extremity of the island. See view facing page 86.

An extensive reef, which dries, and is marked by discoloration, and on which there are a number of islets, extends about 3 miles westward

Charts 942a, 2759a, 1263.

Chart 2788.

from the western side of Djoronga. Several islands, some of which are connected by reefs which dry, lie within 3 miles of the southern side of Djoronga. There is a small hilly ridge on Gumutu, which lies on the 5 reef, which dries, about three-quarters of a mile from the western side of Djoronga; and there is a well defined round hillock on Orang Kaja, situated about $1\frac{1}{2}$ miles south-eastward of Gumutu. Kubi, an islet with a double peak, 510 feet (155^m4) high, lies close north-eastward of Orang Kaja. The other islets in this vicinity are flat, and wooded 10 or covered with mangroves.

A vessel with local knowledge, of 180 feet (54^m9) in length, with a draught of about 10 feet (3^m0), can enter the inlet in the reef between Telor and Tadoku, islets situated southward of Tandjung Domoro ma 15 doto, with the large tree on the southern hill of Djoronga bearing 296°, but it is advisable to send a boat in ahead. Sheltered anchorage may be obtained, in a depth of 7 fathoms (12^m8), close within the entrance, with Kampung Tawabi bearing 018°, the northern end of Kubi bearing 299° and Batu Anjer (*see* below) in line with the southern end of Tadoku, bearing 117°. Vessels should not go north-eastward of 20 that position. Care is necessary inside the islet as the deeper parts have much the same appearance as some dark rocks against the white sandy bottom. From the head of the inlet there is a boat channel across the reefs westward.

Ganoné or Klein Geelmuiden, an islet with a hillock, on which there 25 is a tree with a round top, lies about $1\frac{1}{2}$ miles westward of the western extremity of Djoronga. Two shoals, slightly marked by discoloration, with depths of 23 and 29 feet (7^m0 and 8^m8) over them, lie $1\frac{1}{2}$ miles south-westward and north-eastward, respectively, of Ganoné. There is sometimes a strong stream in the vicinity of Ganoné and Woka.

30 Batu Anjer or Zwarte klippen (Batu Anyer or Black rock), 24 feet (7^m3) high, lies 4 miles south-eastward of Tandjung Domoro ma doto. It is an old crater and is steep-to.

Damar or Salomakie, an island which lies about 2 miles northward of Djoronga, is covered with trees. Kampung Kukupang stands on 35 piles at the north-western extremity of the island; otherwise there is no trace of cultivation or buildings, except on the islets Katinai Besar and Katinai Ketjil, lying within $1\frac{1}{2}$ miles of the north-eastern coast. (*See* view facing this page). Anchorage can be obtained both eastward and westward of Katinai Besar. Tapa is an island with low hills, 40 lying close off the south-western side of Damar with a very narrow channel with a least depth of about 8 fathoms (14^m6) in it, and clear of dangers, between. The channel between Tapa and Djoronga is deep and clear of dangers.

MOROTAI.—This island, lying with Tandjung Wajabula (Waya- 45 bula), its western extremity, about 9 miles north-eastward of the northern end of Halmahera, is mostly high, the Sabatai gebergte attaining an elevation of 4,099 feet (1249^m4); there is another summit in the same range with a double peak, 3,318 feet (1011^m3) high, which stands about $6\frac{1}{2}$ miles farther north-eastward. *See* view facing page 86.

50 **North-western side of Morotai. — Coast. — Anchorage.** — Tandjung Sopi (*Lat.* 2° 39' N., *Long.* 128° 34' E.), the northern extremity of Morotai, is low but rises gradually within; it is fringed by a wide reef, on the edge of which are some boulders. Teluk Sopi,

Charts 943, 1263.

Chart 2788.

entered between Tandjung Sopi and Tandjung Padangi, situated about 7 miles south-westward, affords good anchorage to vessels with local knowledge with favourable winds. Kampung Sopi stands at the head of the bay, and behind it there is a lagoon. 5

A shoal, with a depth of 19 feet (5^m8) over it, lies about $1\frac{1}{2}$ miles north-eastward of Tandjung Padangi.

Tidal streams.—The tidal streams are strong eastward of the northern end of Morotai. Off Tandjung Gorango, situated about 11 miles south-south-eastward of Tandjung Sopi, the tidal stream has 10 been observed to set northward with the rising tide, at a rate of 3 knots at neaps.

Coast.—Anchorages.—Between Tandjung Sopi and Tandjung Wajabula there are a number of peaks, which much resemble each other and differ little in height, with low plains between. Vessels can 15 navigate fairly close to the coast everywhere. Anchorage may be obtained by vessels with local knowledge off this coast, but only in considerable depths and close offshore. There are anchorages off Kampung Berri Berri Ketjil, situated about 2 miles south-westward of Tandjung Padangi, in a depth of about 8 fathoms (14^m6); off 20 Kampung Hapo, situated about 3 miles farther south-westward, in a depth of about 15 fathoms (27^m4); a vessel with a length between 160 and 200 feet (48^m8 and 61^m0), can, in very calm weather, anchor on the line joining the entrance points of this small inlet, but it is usually better to anchor outside this line. Off Kampung Libano, situated 25 about $4\frac{1}{2}$ miles south-westward of Hapo, in a depth of about 15 fathoms (27^m4); and off Tjio (Chio), situated about $5\frac{1}{2}$ miles south-south-westward of Libano, in a depth of about 12 fathoms (21^m9).

Rao.—This island is separated at its south-eastern end from Tandjung Wajabula by Straat Rao, which has a least width of about $1\frac{1}{2}$ 30 miles. On the eastern side of the island there is a mountain, 1,556 feet (474^m2) high, the summit of which appears as a cone from south-westward. A lower inconspicuous peak is situated on the southern slope, which terminates in a hill, 920 (280^m4) high, on the south-western side of the island. This ridge descends gradually westward 35 to a fairly wide plain, which is covered with forest, broken occasionally on the coast by coconut plantations. There are three caves in the steep cliff in the vicinity of Kampung Aru, situated on the east coast about $2\frac{1}{2}$ miles southward of the northern extremity of the island, which are visible from seaward. (*Lat. $2^{\circ} 23' N.$, Long. $128^{\circ} 10' E.$*). 40

Tuanane, a rocky islet, thickly covered with vegetation, lies on the outer edge of the coastal reef close off the northern extremity of Rao; and Tjapali (Chapali) is a similar islet lying on the coastal reef close off the east coast, about 3 miles southward.

Chart 2787, plan of Rao strait and Wayabula road.

45

Saminjamau is a low islet, thickly covered with vegetation, lying close off the southern extremity of Rao; the western side of the islet is rocky.

Straat Rao.—Anchorages.—Straat Rao has a least depth of 23 feet (7^m0) in the fairway. A bank, with a least depth of 26 feet (7^m9) over it, extends about 8 cables from the western side of the strait. The channels on either side of the 23-foot (7^m0) shoal in the middle are indicated by strong tide-rips.

Rede Wajabula (Wayabula) is situated off Kampung Wajabula

Charts 943, 1263.

Chart 2787, plan of Rao Strait and Wajabula road

(*Lat.* $2^{\circ} 17' N.$, *Long.* $128^{\circ} 12' E.$), about half a mile eastward of Tandjung Wajabula, a low point, on which there is a prominent tree. There is a pier and flagstaff at the village. A vessel approaching
 5 from westward, and having passed southward of Saminjamau, should bring the southern extremity of that island astern, bearing 282° , and anchor, in a depth of 11 fathoms (20^m), when the prominent tree on Tandjung Wajabula bears 038° . A more sheltered anchorage is
 10 northward of the two reefs which dry, lying about one mile southward of the village. Vessels from westward should pass between the western of these reefs and the 3-foot (0^m) patch about 6 cables southward of it, and thence between the two reefs.

The western side of Morotai is described with Straat Morotai on page 85.

*15 Chart 2788.***Eastern and southern sides of Morotai.—Coast.—Anchorages.**

—Between Tandjung Sopi and Tandjung Selepia, situated about 15 miles south-south-eastward, the coast is clear of dangers, but at the latter point the coastal reef extends $4\frac{1}{2}$ cables offshore, which is always
 20 distinguished by the heavy surf on it.

Chart 2787, plan of Berri Berri anchorage.

The only anchorage between Tandjung Selepia and Tandjung Boboro, about 7 miles south-south-westward, is off Kampung Berri Berri, situated $2\frac{1}{2}$ miles from Tandjung Selepia. This village stands
 25 at the head of a bight which is sheltered by a reef which dries, on which is Tabailengi, an island, covered with casuarina trees, lying about one mile offshore, east-south-eastward of the village. The approach northward of the reef is unsafe owing to a shoal with a least depth of 7 feet (2^m) over it, lying $6\frac{1}{2}$ cables northward of the
 30 island, and other shoals, which are only slightly marked by discoloration. Vessels may anchor between Berri Berri and Tabailengi, in a depth of about 22 fathoms (40^m), sand and coral.

Small vessels with local knowledge, with a length not exceeding 100 feet (30^m), may anchor in the bight in the coastal reef off the
 35 entrance to Godji kreek (Kali Goji), about half a mile southward of Berri Berri. This is the best landing place.

The channel between the reef, which dries, the northern extremity of which lies about 7 cables south-eastward of Tandjung Selepia, and the coast of Morotai, is only suitable for small vessels with local knowledge.
 40 The sandbank on the western edge of this reef is seldom covered and is subject to change.

Chart 2788.

Along the east coast between Tandjung Boboro and Tandjung Posi Posi, which lies about 13 miles south-south-westward, there is a ridge
 45 with fairly conspicuous peaks, varying in elevation from about 820 to 1,600 feet (249^m to 487^m), behind which, near the middle of the island, is the Sabatai gebergte. See view facing page 86.

Between Tandjung Boboro (*Lat.* $2^{\circ} 18' N.$, *Long.* $128^{\circ} 39' E.$) and Kampung Busu Busu, situated about 7 miles south-south-westward,
 50 there is a barrier reef, lying from about half to three-quarters of a mile offshore; between it and the coast there is a deep channel with smooth water, which, however, is only suitable for small vessels with local knowledge. There is a large opening in the reef off Tandjung Lefau, situated about $1\frac{1}{2}$ miles north-north-eastward of Busu Busu;

Charts 943, 1263.

Chart 2788.

this point is easily identified by a small rock on the edge of the coastal reef, and by a white sandy beach, which extends from close northward of it to Kampung Bidoho, situated about 2 miles south-south-westward of Tandjung Boboro.

From October to March, inclusive, a heavy swell sets into the bay, at the head of which Kampung Busu Busu is situated, and vessels do not lie safely there during this period.

Close westward of Tandjung Posi Posi is Kampung Sangowo, off which there is a small opening in the coastal reef, with depths of from 19 to 33 feet (5^m8 to 10^m1) in it, through which small craft with local knowledge can enter. There is usually a swell outside, but small craft can always land safely in the opening.

Vessels with local knowledge may obtain anchorage outside the reef, in a depth of not less than 22 fathoms (40^m2).

The coast between Tandjung Posi Posi and Tandjung Gila, the south-western extremity of Morotai, can be safely approached to within a distance of one mile, the only dangers being two reefs, each with a depth of less than 6 feet (1^m8) over it, lying about 4½ and 6½ miles south-westward of Tandjung Posi Posi. Temporary anchorage may be obtained by vessels with local knowledge in a depth of about 26 fathoms (47^m5), sand, off Kampung Sabatai, situated at the mouth of a river about 9 miles west-south-westward of Tandjung Posi Posi.

STRAAT MOROTAI.—Islets and dangers.—Anchorages.—

This passage, between the northern end of Halmahera and the western side of Morotai, is clear of dangers in the fairway, but there are some detached shoals in the southern approach (*see* page 87).

At the northern extremity of Halmahera is Baai van Supu, entered between Tandjung Bisoa (page 61) and Tandjung Luga, which lies about 4½ miles east-south-eastward, in which anchorage may be obtained by vessels with local knowledge, in a depth of about 15 fathoms (27^m4), off Kampung Supu, situated at the head of the bay. On the western side near the head of the bay the coastal reef extends over one cable offshore, and there are some detached rocks lying within the edge of this reef. (*Lat.* 2° 12' N., *Long.* 127° 59' E.).

The land slopes gradually towards Tandjung Bisoa and Tandjung Djodjefa (Jojefa), situated 7 miles eastward. Both points are fringed by a narrow reef, which dries, but they can be rounded safely at a short distance. Between Tandjung Djodjefa and Tandjung Salimuli, a low point, which lies about 14 miles south-south-westward, the coast is steep-to, but there is a 6-foot (1^m8) patch about a quarter of a mile offshore off Kampung Lapi, situated about 2½ miles northward of Tandjung Salimuli, and a 13-foot (4^m0) patch about one mile north-eastward of this point. The mountain range in the middle of this peninsula is described on page 60.

Anchorage may be obtained by vessels with local knowledge in favourable weather off Saluta, situated 4½ miles northward of Tandjung Salimuli, and the villages of Lapi and Tufu ma lolè, the latter situated about half a mile southward of Lapi; the depths, however, are considerable, and the bottom is steep.

The mountains on the western side of Morotai, which attain an elevation of about 3,300 feet (1005^m8), afford no landmarks for vessels proceeding through Straat Morotai; the peaks of the Sabatai geberge

Charts 2788, 943, 1263.

Chart 2788.

are difficult to identify, and the only hill near the coast is Bandera, 657 feet (200^m2) high, which stands about 7½ miles northward of Tandjung Gila (*Lat. 1° 59' N., Long. 128° 15' E.*). The low islands, covered with coconut trees, which lie off this coast, are, however, good marks, and some of them are connected to each other by drying reefs, which are well marked by discoloration.

Chart 2787, plan of Tanjung Wayabula to Tandjung Gila.

Ngèlé Ngèlé Besar and Ngèlé Ngèlé Ketjil, on which there are large 10 villages and important coconut plantations, are the northernmost islets southward of Tandjung Wajabula; they lie on the eastern edge of the same reef, which dries, about 1½ miles from the coast of Morotai. Katjuwawa, which is also inhabited, lies close off Kampung Tilei, situated on the Morotai coast about 5 miles south-south-eastward of 15 Tandjung Wajabula. Kampung Tilei can be reached in a least depth of 19 feet (5^m8).

A bank, with a depth of 17 fathoms (31^m1) over it, lies about 3½ miles west-north-westward of the northern extremity of Ngèlé Ngèlé Besar.

20 A 20-foot (6^m1) patch lies about 2 miles north-eastward of the northern extreme of Ngèlé Ngèlé Besar, and 6 cables off the coast of Morotai.

A 20-foot (6^m1) patch, an 18-foot (5^m5) patch, a 25-foot (7^m6) patch and a shoal, with a depth of 23 feet (7^m0) over it, lie near the fairway 25 of the channel between Ngèlé Ngèlé Besar and the Morotai coast and about a mile eastward, 1½ miles east-south-eastward, a mile south-south-eastward and 1½ miles south-eastward, respectively, of the northern extreme of Ngèlé Ngèlé Besar.

A 16-foot (4^m9) patch and a 25-foot (7^m6) patch lie on the eastern 30 side of the fairway about a mile east-north-eastward and 9 cables eastward, respectively, of Ngèlé Ngèlé Ketjil.

Loleba Besar and Loleba Ketjil lie on the eastern edge of a reef, which dries, nearly 2 miles southward of Ngèlé Ngèlé Ketjil, Galo Galo Besar, which is inhabited, and Galo Galo Ketjil lie on the south-western 35 edge of the same reef. Eastward of this group, on the Morotai coast, is Kampung Dowongi Kokotu.

A 15-foot (4^m6) patch lies on the eastern side of the channel between Loleba Besar and the Morotai coast about a mile east-south-eastward of the northern extreme of the island.

40 Pasir Besar, which dries, lies about a mile southward of Loleba Ketjil; a 3-fathom (5^m5) patch lies about half a mile eastward of the northern extremity of Pasir Besar.

A 3-foot (0^m9) patch lies in the fairway between Galo Galo Besar and Dodola Besar and about 9 cables south-westward of the southern 45 extremity of the former island.

Dodola Besar, (*Lat. 2° 05' N., Long. 128° 11' E.*) Dodola Ketjil, Kolorai and Kokoja (Kokoya), which is inhabited, lie on one reef, which dries, the northern end of which lies about 1½ miles southward of Galo Galo Besar. A conspicuous tree stands on the reef about one 50 cable northward of the north-western extremity of Dodola Besar. Kokoja, which lies near the southern extremity of the reef, can be identified by a white sandy beach on which there are a few huts, on its eastern side. A shoal, with a depth of 16 feet (4^m9) over it, lies about half a mile west-north-westward of the northern extremity of Dodola Besar.

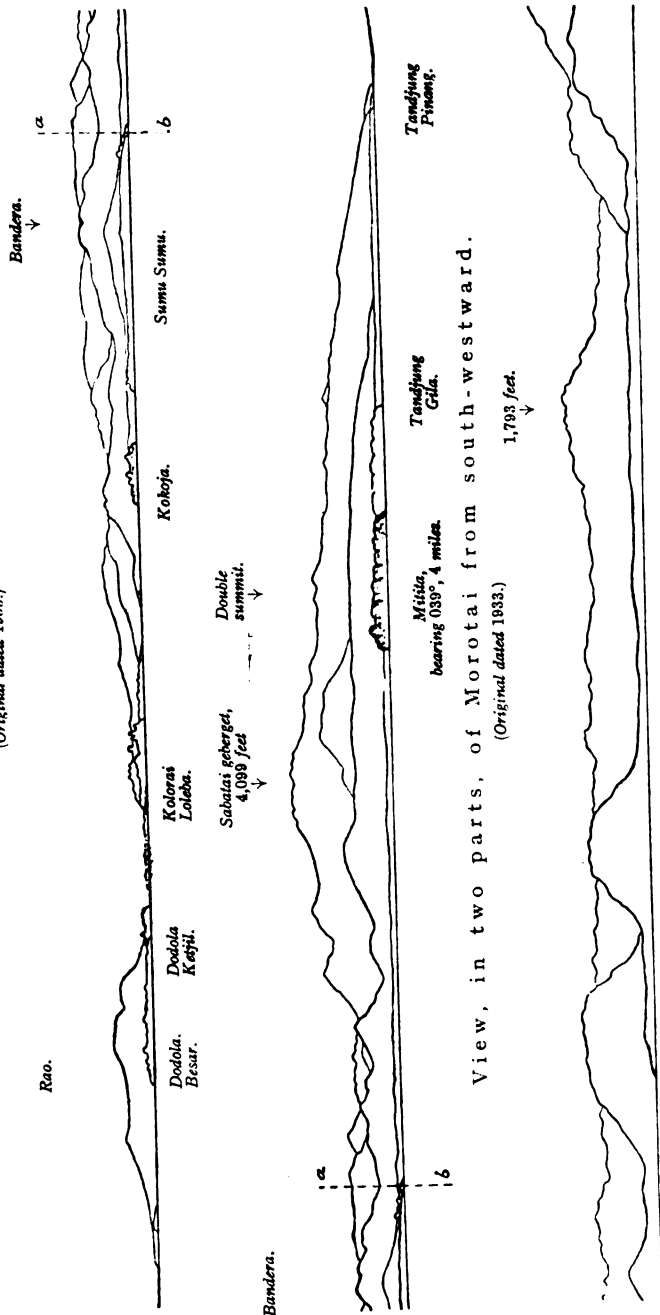
Charts 2788, 943, 1263

Libobo (986-foot hill).

Zwartkopskloof,
bearing 135°.

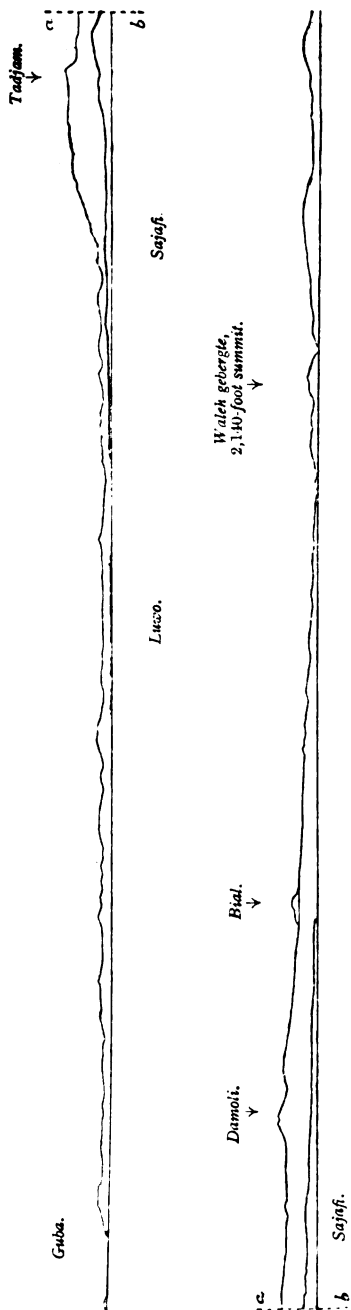
Djoronga and Damar from south-south-eastward.

(Original dated 1933.)



View, in two parts, of Morotai from south-westward.

(Original dated 1933.)



View, in two parts, of mountains southward of Buli baai from vicinity of
Togoplun.
(Original dated 1933.)

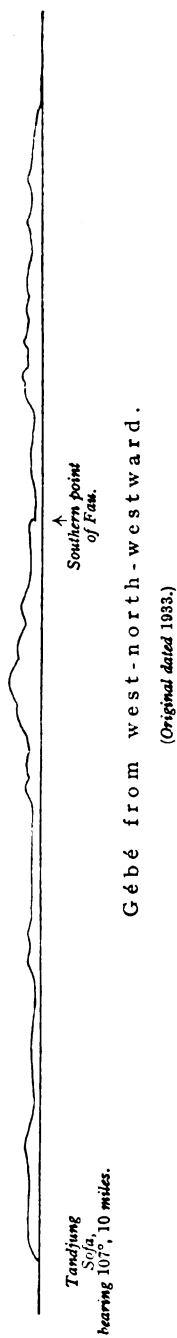


Chart 2787, plan of Tanjong Wayabula to Tanjong Gila.

A $5\frac{1}{2}$ -fathom (10^m1) patch lies in the fairway nearly midway between Dodola Besar and Pasir Besar; a 16-foot (4^m9) patch lies about 8 cables eastward of the southern extreme of Dodola Besar.

There are a number of islets and shoals lying between the reef, 5 which dries, and the Morotai coast.

A 3-foot (0^m9) patch lies about $2\frac{1}{2}$ miles east-north-eastward of Kolorai.

A reef lies about $4\frac{1}{2}$ miles eastward of Kolorai and close off the Morotai coast.

A 16-foot (4^m9) patch and an 18-foot (5^m5) shoal lie respectively, 10 about $1\frac{1}{2}$ and $3\frac{1}{2}$ miles east-south-eastward of Kolorai.

A 6-foot (1^m8) patch, a 16-foot (4^m9) patch and a 13-foot (4^m0) patch, lie about one mile north-north-eastward, $1\frac{1}{2}$ miles north-eastward and nearly $2\frac{1}{2}$ miles east-north-eastward, respectively, of 15 Kokoja.

Nip rif lies about $3\frac{1}{2}$ miles east-north-eastward of Kokoja, and half a mile off the Morotai coast.

A 14-foot (4^m3) shoal lies close north-westward of Nip rif.

Tandjung Gila is the termination of a low tongue of land, covered 20 with low vegetation. A spit, with a least depth of 13 feet (4^m0), over it, extends about one mile from the point. Mitita is a coral islet, thickly covered with vegetation, lying $1\frac{1}{2}$ miles south-westward of Tandjung Gila.

The eastern extremity of Kokoja, in line with the middle of Kolorai, 25 bearing about 342° , leads through the channel between Mitita and Tandjung Gila, in the deep channel between the spit mentioned above and the bank fringing Mitita.

Goja uku (Goya uku), a reef which dries, lies about one mile south-south-westward of Kokoja. Lutu Lutu, a shoal with a depth of 30 19 feet (5^m8) over it, lies $2\frac{1}{2}$ miles south-south-westward of Kokoja. Pona Ponata, with a depth of 26 feet (7^m9) over it, lies about 2 miles westward of Mitita, and between them is Dododa hohé, a patch which dries one foot (0^m3).

Chart 2788.

35

Kokomoruku, with a depth of 10 fathoms (18^m3) over it, lies about $2\frac{1}{2}$ miles south-westward of Mitita. Momow riffen are two patches, with depths of 23 and 26 feet (7^m0 and 7^m9) over them, lying about 10 and 12 miles, respectively, south-westward of Mitita; they are seldom marked by discoloration, but there are tide-rips in their vicinity 40 occasionally.

Luku Luku, with a depth of 100 fathoms (182^m9) over it, lies between Kokomoruku and Momow riffen.

Charts 2787, plan of Galela road, 2788.

EASTERN SIDE OF HALMAHERA.—Climate.—Bocht van 45 Galela.—Anchorage.—The climate on the east coast of Halmahera is such as might be expected along a steep high coast, which nowhere has extensive marshes or mudbanks; it is fresh and healthy. Bocht van Galela is entered between Tandjung Salimuli (*Lat. $1^\circ 59' N.$, Long. $127^\circ 57' E.$*) and Tandjung Luari, which lies about 11 miles southward. Between Tandjung Salimuli and Kampung Limau, situated $7\frac{1}{2}$ miles south-westward, the spurs from Silo and the mountains north-eastward (page 60) approach the coast; thence southward to the high

Charts 2788, 943, 1263

Charts 2787, plan of Galela road, 2788

mountain range southward of the bay the coast is bordered by a wide, low plain. Tarakan Itji (Ichi) and Tarakan Lamo, truncated cones, 917 and 1,245 feet (279^m5 and 379^m5) high, respectively, standing 5 within the south-western corner of the bay, are prominent features. See view facing page 86. About 2½ miles southward of Tarakan Lamo, and separated from it by a valley is a hilly ridge, which rises to a conical summit, 867 feet (264^m3) high, southward of which there is a depression, and thence the land rises to Valsche Dukono. Mamuja 10 (Mamuya), a conical mountain, 3,049 feet (929^m3) high, with a depression in its summit, standing about 2 miles southward of Tandjung Luari, is conspicuous.

There are two 6-foot (1^m8) patches lying close offshore, one about half a mile north-eastward of Kampung Possi Possi (Posi Posi), 15 situated 5 miles south-westward of Tandjung Salimuli, and the other about one mile north-eastward of Kampung Limau. A 10-foot (3^m0) patch lies nearly three-quarters of a mile west-north-westward of Tandjung Luari. Between Kampung Gilitopa, situated about one mile southward of Limau and Kampung Galela, 5 miles southward, 20 there is an inaccessible marshy plain. Temporary anchorage may be obtained anywhere, in depths of from 22 to 33 fathoms (40^m2 to 60^m4). *Chart 2787, plan of Galela road.*

Rede Galela.—Anchorage.—This roadstead is situated off Kampung Galela, in the south-western part of Bocht van Galela, westward 25 of Tandjung Bongo. There is a boat pier southward of the village. Some buildings with zinc roofs in the northern part of the village can be seen from a considerable distance.

Tiabo rivier flows out about 3 miles northward of Tandjung Bongo, and is accessible for boats with local knowledge; there is a bank off its 30 mouth, through which there is a channel with a depth of 5 feet (1^m5) in it, and which leads along the southern bank of the river.

Anchorage may be obtained off Galela, in depths of from 16 to 27 fathoms (29^m3 to 49^m4), fine sand, between the boat pier and the islet close offshore westward of Tandjung Bongo. It is sheltered during 35 the southerly monsoon, but is unsafe with a high swell in the North-west monsoon. Landing can be effected, even with the heaviest surf, southward of the islet. Sometimes at night, a malodorous vapour rises from the low land, when the wind from the land is weak or absent. *Chart 2788.*

40 **Coast.**—Between Tandjung Luari and Tandjung Gorango, situated about 17 miles south-south-eastward, the coast is low, but rises inland to a mountain range, of which the most prominent peaks are Valsche Dukono, about 2,950 feet (899^m1) high, situated about 5½ miles south-westward of Tandjung Luari, Dukono, an active volcano, 45 4,181 feet (1274^m4) high, and Togohi, 4,194 feet (1278^m4) high. Farther southward the land descends to an extensive plain, in which are Tokito, Tami and Ah, mountains from about 1,700 to 1,900 feet (518^m2 to 579^m1) high.

Tobelo eilanden.—Dangers.—This low group of coral islands lie 50 within 3½ miles of the coast between Tandjung Luari (*Lat.* 1° 49' N., *Long.* 127° 55' E.) and Tandjung Gorango. They are rocky on their eastern and north-eastern sides, and are covered with high trees. The drying reefs, which extend from them in places, are well marked by discoloration. The larger islands, including Tonuu, situated at

Charts 2788, 2575, 943, 1263.

Chart 2788.

the northern end of the group, Kakara lamo, Tagaja, Kolorai and Miti, which lies at the southern end, are inhabited.

There is a clear channel within Tonuu, Kakara lamo and Tagaja, but there is foul ground near the Halmahera coast; there are also passages clear of dangers in the fairway between some of the islands. 5

Patola, with a depth of 11 feet (3^m4) over it, sometimes marked by surf and usually by discoloration, lies about 1½ miles east-south-eastward of the northern extremity of Tagaja.

Anchorage.—Anchorage may be obtained by vessels with local knowledge, in a depth of about 16 fathoms (29^m3), southward of the mouth of Sungei Ruku, on which Kampung Ruku stands, about 2½ miles south-eastward of Tandjung Luari, there is a good berth off Kampung Popilo, between the islets Mede and Popilo which lie westward of Tonuu; there is anchorage for vessels with local knowledge, in a depth of 16 fathoms (29^m3), outside the detached shoals, off Kampung Wari, situated about 3½ miles south-eastward of Ruku, and there is a sheltered anchorage for vessels with local knowledge, in a depth of 14 fathoms (25^m6), off Kampung Mawea, abreast Miti, the southernmost island of the Tobelo group. This anchorage may be reached by passing northward of Miti; the shoals here are marked by discoloration. 10 15 20

Chart 2787, plan of Tobelo road.

Rede Tobelo.—**Dangers.**—**Beacons.**—**Anchorage.**—This roadstead lies between Kumu, an island of the Tobelo group, lying about three-quarters of a mile south-westward of Kakara lamo, and Kampung Tobelo, on the coast of Halmahera. 25

The limit of the roadstead is the arc of an imaginary circle, with a radius of 6,890 feet (2100^m0) and the head of the southern pier as centre.

A detached reef, which dries, marked by an unofficial beacon surmounted by a truncated cone, on its northern edge, lies about 4 cables south-eastward of Kumu. The western edge of the reef fringing the southern side of Kumu is marked by a beacon. Pulu Ubu Ubu is an islet lying on a detached reef, which dries, the northern extremity of which is marked by a beacon on the south-eastern side of the roadstead. A detached reef, close south-eastward of Pulu Ubu Ubu, is marked by a beacon surmounted by a ball on its south-eastern extremity; a shoal with a depth of one foot (0^m3) over it, lies about one cable northward of the northern end of the reef on which Pulu Ubu Ubu stands. (*Lat. 1° 43' N., Long. 128° 01' E.*) 30 35 40

There are two piers at Tobelo; the northern, situated about 2 cables westward of Tandjung Pilawana, has a depth of 8 feet (2^m4) alongside. The southern pier, off Kampung Tobelo, is the landing place for boats, and always has a sufficient depth alongside.

There is a building with a zinc roof near the southern end of Tobelo, near the root of the southern pier. 45

Vessels should approach the roadstead by passing between the south-eastern side of Kumu and the detached reef, marked by a beacon, south-eastward of it, thence north-eastward of Pulu Ubu Ubu, thence northward of the beacon marking the northern edge of the reef extending from Pulu Ubu Ubu and steer for the southern pier, passing southward of several shoal patches, which are of a light brown colour and can be clearly seen; when clear of the southernmost patch, vessels should haul sharply northward, with Tonuu just open east-

Charts 2575, 943, 1263.

Chart 2787, plan of Tobelo road.

ward of Tandjung Pilawana, and anchor before the southern end of Tagaja closes behind Kumu.

Large vessels may obtain anchorage, in depths of from 8 to 10 fathoms (14^m6 to 18^m3), southward of Pulu Ubu Ubu.

Chart 2787, plan of Kau bay.

KAU BAAI.—Kau baai, which separates the northern part of Halmahera from its north-eastern peninsula, is entered between Tandjung Patjikara (Pachikara), situated about 13½ miles southward of Tandjung Gorango (*Lat. 1° 32' N., Long. 128° 02' E.*), and a point about 5½ miles east-south-eastward. The head of the bay is separated from Dodinga baai (page 64), on the western side of Halmehera, by an isthmus, on which there are some hills, about 650 feet (198^m1) high. The western shore is mostly low, the eastern shore is higher and steep.

Bobale, a low island with high trees on it, lies in the entrance on the western side of the fairway.

The plain southward of Togohi, mentioned on page 88, continues southward to the Mata Mata gebergte, within the western side of Kau baai, of which the most prominent peaks are Tabobo or Kasteelberg, 3,046 feet (928^m4) high, and Oosttop (East Summit), 1,750 feet (533^m4) high, 9½ miles eastward. On the eastern side of Kau baai is the high peninsula which separates it from Buli baai (page 93). The summit (chart 2788) of a ridge, 3,801 feet (1158^m5) high, situated about 15 miles east-north-eastward of the eastern entrance point of Kau baai, is prominent. Papudu, 1,366 feet (416^m4) high, which stands about 8 miles eastward of the same point, is an isolated, moderately flat hill, which does not show up well against the higher land behind. Subaini, 3,748 feet (1142^m4) high, and conical, with craters on its north-eastern and south-western sides, and Wato Wato, 4,834 feet (1473^m4) high, which slopes gradually, lie about 10 miles south-south-westward and 13½ miles southward, respectively, of Tandjung Lolobata, situated about 3 miles southward of the eastern entrance point of Kau baai.

Outer part of Kau baai.—In the passage between Bobale and the eastern side of the entrance there is a ridge with a least depth of 21 feet (6^m4) over it in the middle, but there is a deep channel on either side. A 33-foot (10^m1) patch lies about 1½ miles southward of Bobale. In the passage between Bobale and the western shore there are several shoals, with depths of from 6 to 17 feet (1^m8 to 5^m2) over it. Large vessels should not use this passage.

The western side of the bay from the entrance to Tandjung Boleo, about 12 miles south-south-westward, is bordered by coconut plantations. There is a distinctive light coloured house at Kampung Gamlaha, situated about 4 miles south-westward of Tandjung Patjikara. About one mile northward of Tandjung Boleo is Kampung Kau. There is a pier here, which is approached through a boat channel from northward close along the shore; the northern end of the channel is indicated by a white screen situated about half a mile northward of the pier. The bank which forms the eastern side of the channel is usually marked by unofficial stakes.

Anchorages.—Anchorage may be obtained off Kampung Bobale, which stands on the southern side of Bobale, in a depth of about 10 fathoms (18^m3), sand, about 2 cables offshore; this anchorage is moderately calm even in the southerly monsoon.

Charts 2788, 943, 942a, 1263.

Chart 2787, plan of Kau bay.

Anchorage may be obtained, in a depth of about $4\frac{1}{2}$ fathoms (8^m2), sand and mud, in Rede Kau, about one mile eastward of the pier-head, taking care to avoid the 13-foot (4^m0) patch about 8 cables offshore.

Anchorage may be obtained anywhere in Baai van Waisilé, on the eastern side of Kau baai, close inside the entrance, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), mud and sand.

Inner part of Kau baai.—The inner part of Kau baai, in which the shores can be safely followed at a distance of one mile, is seldom visited; it is open to both monsoons, and the sea quickly rises. Between 10 Tandjung Boleo (*Lat. $1^{\circ} 09' N.$, Long. $128^{\circ} 54' E.$*) and Kampung Ake lamo situated about 18 miles south-westward, the western shore is low, rising within to Mata Mata gebergte. Close northward of this village there is a plain, covered with reeds. About 16 miles southward of Kampung Ake lamo there is a peak (chart 2788), 2,692 feet (820^m5) 15 high, which appears as a blunt cone.

Roni, 546 feet (166^m4) high, is an easily identified islet lying close off the eastern shore about 6 miles south-south-westward of Tandjung Tobalien, situated about 11 miles south-westward of Tandjung Lolobata. About 7 miles south-eastward of Roni is the northern end 20 of a prominent ridge which extends about 10 miles southward to Saolat (chart 2788), 4,690 feet (1429^m5) high; between this ridge and the coast there is a low plain.

Anchorage.—Sheltered anchorage may be obtained by vessels with local knowledge during the northerly monsoon, off the villages 25 of Wangeotak and Malifut, in Bocht van Loleo lamo, about 4 miles westward of Tandjung Boleo. Kau rivier flows out between Tandjung Boleo and Wangeotak, and from its mouth, a spit, with depths of less than 6 feet (1^m8) over it, and steep-to, extends about $1\frac{1}{2}$ miles offshore. A powerboat can enter the river at high water. Fresh water can be 30 obtained from the river.

Chart 2787, plan of Bobane bay.

Good anchorage may be obtained in mid-channel, in a depth of 39 feet (11^m9), in the eastern part of Bobane baai, situated on the north-eastern side of the isthmus connecting Kau baai with Dodinga 35 baai, with the pier at Kampung Bobane Igu, bearing about 169° . Kampung Pasir Putih stands about 8 cables eastward of Tandjung Tanu, the eastern entrance point of the bay.

Chart 2787, plan of Kau bay.

A horse track leads from Kampung Bobane Igu to Dodinga baai, 40 see page 64.

Anchorage may be obtained by vessels with local knowledge, in a depth of 22 fathoms (40^m2), mud and sand, in Rede Aké Selaka south-westward of Aké Selaka or Babing, an islet lying close offshore about 2 miles north-north-eastward of Roni. Kampung Aké Selaka 45 is situated on the coast close south-eastward of the islet. A reef, with a least depth of 3 feet (0^m9) over it, not marked by discoloration, lies about one mile northward of the islet Aké Selaka, and about $4\frac{1}{2}$ cables offshore.

The shipping place for forest produce is situated close northward 50 of Roni.

Anchorage may be obtained by vessels with local knowledge off several villages on the south-eastern shore of Kau baai. Off Ekor, on the southern shore, there is anchorage, with the village bearing 180° ,

Charts 2788, 943, 942a, 1263.

Chart 2787, plan of Kau bay.

and a white patch, 105°. Landing can be effected at high water in the small river which flows out here. There is an extensive plain between Ekor and Kampung Pintatu, situated about 5½ miles westward.

5 *Charts 2787, plan of Kau bay, 2788.*

Directions.—A vessel approaching Kau baai from northward should pass about 2 miles eastward of Miti, and then steer for Bobale. Batu Kubu, on which there is a white patch, situated about 4½ miles southward of Tandjung Gorango (*Lat. 1° 32' N., Long. 128° 02' E.*), is
10 a good mark. About 3½ miles farther southward is Tandjung Tunowé, from which a small bank extends, which causes tide-rips.

Chart 2787, plan of Kau bay.

The usual entrance to Kau baai is eastward of Bobale, but a vessel should not pass over the ridge in the middle, as it has not been closely
15 examined and less depths may exist. A stream with a maximum rate of 1½ knots has been observed to set through the channel on either side of Bobale.

Chart 2788.

COAST.—The coast between Tandjung Lolobata and Tandjung
20 Lelai, situated 43 miles north-eastward, is partly bordered by cliffs, and the greater part rises steeply to high land close within. The coastal reef, which only fringes this stretch in places, is generally narrow.

The mountains north-eastward of Kau baai afford the principal
25 landmarks for a vessel proceeding south-eastward from Straat Morotai. Beside the ridge east-north-eastward of the entrance to Kau baai, described on page 90, Iga, 2,413 feet (735^m5) high, Tatem, 3,125 feet (952^m2), and Bobolo, 1,763 feet (537^m4), situated about 15, 25 and 31 miles, respectively, north-eastward of Tandjung Lolobata, are good
30 marks. Watida, which has a double peak, about 2,977 feet (907^m4) high, and the peaks close eastward of it, situated about 11½ miles south-westward of Tandjung Lelai, the north-eastern extremity of the peninsula, are visible over the hilly land to a vessel a few miles offshore, especially from northward.

35 **Anchorages.**—Anchorage may be obtained by vessels with local knowledge, in a depth of about 18 fathoms (32^m9), about 1½ miles north-eastward of Kampung Njaulaku (Nyaulaku), on the northern end of the eastern entrance point of Kau baai. There is good anchorage off Kampung Iga, situated about 15 miles north-eastward of Njaulaku,
40 and in Bobolo baai, situated about 14 miles farther north-eastward, in a depth of about 20 fathoms (36^m6), about half a mile offshore, with the eastern Bobolo peak, 1,698 feet (517^m6) high, bearing about 169°.

HALMAHERA SEA.—Halmahera sea lies between the eastern side of Halmahera and the western points of Waigeu and Batanta
45 (pages 214 and 223). The northern part is separated from the southern part by Djailolo passage (page 96).

The current in Halmahera sea is not strong, and depends on the direction and force of the wind.

Coast.—Tandjung Lelai, which is low, is fringed by a reef, which
50 dries, extending north-eastward for nearly 1½ miles. To a vessel off the eastern coast of Halmahera southward of this point, Watida, which appears as a sharp peak from eastward, the peaks eastward of it, and

Charts 943, 942a, 1263.

Chart 2788.

the flat peak, 2,738 feet (834^m6) high, which stands about 3½ miles south-south-eastward of Watida, are easily identified. Tandjung Petak, situated about 11 miles southward of Tandjung Lelai, can be identified by a flat double-peaked hill, 483 feet (147^m2) high, close within it, which appears as an islet from a distance. About 5 miles south-south-westward of Tandjung Petak there is a prominent hill 792 feet (241^m4) high, close within the coast. Thence to Tandjung Wajamli, about 11½ miles southward, there is a chain of coastal hills, over which the peaks of Watam gebergte, situated about 9 miles inland, are visible. 10

Current.—See page 19.

Anchorage.—**Dangers.**—Anchorage may be obtained by vessels with local knowledge, in depths of from 14 to 16 fathoms (25^m6 to 29^m3), in Dabo baai, entered about 3 miles southward of Tandjung Lelai (Lat. 1° 35' N., Long. 128° 43' E.). Karang Patliang, with a least depth of 11 feet (3^m4) over it, marked by discoloration or surf, lies about three-quarters of a mile eastward of Tandjung Patliang, the south-western entrance point of the bay, and a rock, with a depth of 8 feet (2^m4) over it, lies between them. There is better anchorage in Ake lamo baai, entered between Tandjung Patliang and Tandjung Petak. Kampung 20 Ake lamo stands on the shore of the bay about 2½ miles southward of Tandjung Patliang.

There is anchorage for vessels with local knowledge off Kampung Tifonis, situated about 3 miles southward of Tandjung Petak, north-westward of a sandbank, which dries. Small craft with local knowledge 25 can anchor between the sandbank and the coast.

Chart 2787, plan of Buli bay.

BULI BAAI.—**Dangers.**—Buli baai, entered between Tandjung Wajamli (Wayamli) and Tandjung Inggelang, situated about 31 miles southward, is backed by high land; over the greater part it is encum- 30 bered with dangers, and is practically only navigable for vessels bound for Kampung Buli, situated on its northern shore, about 27 miles west-south-westward of Tandjung Wajamli.

Tandjung Wajamli is low, but rises to Onat, 1,383 feet (421^m5) high, about 2½ miles within. The mountains along the northern side of the 35 bay have no distinctive features.

Chart 2788.

On the southern side the prominent peaks from west to east are:—the summit of Waleh gebergte, 2,140 feet (652^m3) high, about 25 miles westward of Tandjung Inggelang, Bial, Foni, Damoli and Tadjam 40 (Tajam), which is conical, all standing within 13 miles of the same point. See view facing page 87.

Chart 2787, plan of Buli bay.

The only villages on the northern side of the bay are Watam and Wajamli, situated about 3½ and 13 miles west-south-westward, respec- 45 tively, of Tandjung Wajamli.

Sailal, with a depth of 6 fathoms (11^m0) over it, lies about 1½ miles south-eastward of Tandjung Wajamli. Semar, with a depth of 15 feet (4^m6) over it, lies about 1½ miles eastward of Tandjung Mokali, situated about 11½ miles west-south-westward of Tandjung Wajamli. Metonga 50 or Gareel rifen are two patches, with depths of 3 and 16 feet (0^m9 and 4^m9) over them, lying about 3½ miles south-south-eastward of Tandjung Mokali. Between Tandjung Mokali and Kampung Buli there are a

Charts 942a, 1263.

Chart 2787, plan of Buli bay.

number of off-lying reefs, the positions of which may best be seen on the chart. Litin, which dries, situated about 5 miles eastward of Kampung Buli, is well marked by discoloration.

- 5 On the southern side of Buli baai there are several unimportant villages. Pulu Inggelang, which is covered with high vegetation, is the largest of three low islets lying close north-westward of Tandjung Inggelang, and on the southern side of this island there is a village of the same name with a small pier. About $2\frac{1}{2}$ miles northward of
10 Pulu Inggelang is Woto, an islet covered with high vegetation. Wor is an islet lying about $5\frac{1}{2}$ miles westward of Woto.

Anchorage.—Anchorage may be obtained by vessels with local knowledge anywhere off the northern shore of Buli baai, the principal anchorage being in Rede Buli, off Kampung Buli (*Lat.* $0^{\circ} 53' N.$,
15 *Long.* $128^{\circ} 17' E.$), which is a shipping place for copra and forest produce.

Anchorage may be obtained, in a depth of about 5 fathoms (9^m1), sheltered during the South-east monsoon, westward of Tjef (Chef), an islet close westward of Pulu Inggelang. Small craft with local know-
20 ledge may obtain a sheltered anchorage off Kampung Inggelang, but the channel southward and westward of Pulu Inggelang is narrow and dangerous.

There is anchorage for vessels with local knowledge northward of Kampung Bitjoli (Bicholi), situated about $10\frac{1}{2}$ miles west-north-
25 westward of Tandjung Inggelang, in a depth of about 10 fathoms (18^m3). During the North-west monsoon it is better to anchor under the lee of Wor, in a depth of about 15 fathoms (27^m4). The best landing place is close eastward or westward of Kampung Bitjoli.

There is always a safe anchorage for vessels with local knowledge off
30 Kampung Maba, situated about 15 miles north-westward of Kampung Bitjoli. The shores of Sololo baai, at the head of Buli baai, are uninhabited.

Rede Buli.—Directions.—Beacons.—A vessel approaching Buli baai from northward can round Tandjung Wajamli at a short distance
35 and pass between it and the reef Sailal, thence she should keep about 2 miles off the northern shore, passing southward of the reef Semar and between Tandjung Mokali and Metonga riffen, thence she should steer to pass southward of Litin, and thence for the anchorage, which is in a depth of from 11 to 14 fathoms (20^m1 to 25^m6), westward of a
40 29-foot (8^m8) patch and about three-quarters of a mile south-south-eastward of a prominent shed, which stands near the pier at Kampung Buli. The channel which leads to the pier between the reefs, which dry, is marked by unofficial beacons.

A shoal, with a depth of 3 feet (0^m9) over it, lies about $1\frac{1}{2}$ miles
45 eastward of Kampung Buli.

A vessel approaching Buli baai from eastward should steer to pass northward of Leleve and Sain, situated about $13\frac{1}{2}$ and 17 miles, respectively, north-westward of Tandjung Inggelang, thence southward of Ronde rif, an atoll-shaped reef, which dries, marked by discoloration,
50 about 5 miles west-north-westward of Sain, thence she can steer for the anchorage in Rede Buli.

A vessel approaching from southward should give Tandjung Inggelang a good berth, thence steer to pass between Pulu Inggelang and Woto, thence southward of Wor, taking care to clear the 8-foot

Charts 2788, 943, 942a, 1263.

Chart 2787, plan of Buli bay.

(2^m4) patch lying about half a mile south-westward of the islet, thence she should steer to pass eastward and northward of Mia, an islet situated about 3½ miles north-westward of Wor; Pinit and Toppo, reefs which dry, lying northward of Mia, are marked by discoloration. 5 Thence there is a clear channel to Rede Buli, passing westward of Woi, a reef which dries, marked by discoloration, about 4 miles north-north-westward of Mia, and westward of Ronde rif.

Tidal streams.—Current.—Within Buli baai, only weak tidal streams are experienced. Outside the bay, during the South-east 10 monsoon, the tidal stream is not felt, but a current sets north-north-westward, attaining a maximum rate of 2 knots. In the channel southward of Pulu Inggelang the current runs at the rate of 1½ knots. Strong tide-rips, which sometimes break, occur off Tandjung Inggelang and Tandjung Wajamli. 15

Chart 2788.

Off-lying islands and dangers.—Light.—Volcanic disturbances.—An extensive bank, with depths of less than 100 fathoms (182^m9) over it, on which there are a number of islets and shoals, lies in the eastern approach to Buli baai. Close off the south-western side 20 of this bank, about 14 miles east-north-eastward of Tandjung Inggelang (Lat. 0° 33' N., Long. 128° 41' E.), there is a smaller bank, with a least depth of 29 feet (8^m8) over it. On the north-western edge of the extensive bank, which lies 17 miles north-eastward of Tandjung Inggelang, there is a 39-foot (11^m9) patch. Canton Packet, a rock 25 which dries, lies about 2½ miles eastward of the 29-foot (8^m8) shoal, and about 6 miles farther eastward is Togoplun, or Recovery islet, 77 feet (23^m5) high, almost devoid of vegetation, which, from a distance, appears as a vessel. Jiew (Yiw), or Katharine islet, 188 feet (57^m3) high, thickly covered with vegetation, lies about 7½ miles north- 30 eastward of Togoplun. There is a high rocky islet, covered with vegetation, lying close off the eastern side of Jiew, and a rocky islet close off its north-western extremity.

A submerged reef was reported, in 1945, to lie about 13½ miles north-eastward of Jiew. 35

Charts 2788 and 3248.

Volcanic disturbances have been reported in an area 15 miles wide between Lat. 0° 18' N., Long. 129° 54' E. and Lat. 1° 00' N., Long. 129° 00' E., and, in 1948, a great disturbance was observed in an area, with a radius of about one mile, centred about 12 miles eastward 40 of Jiew.

Chart 2788.

A light is exhibited, at an elevation of 27 feet (8^m2), from Jiew. This light was extinguished, in 1947.

Aurora bank, which lies about 23 miles eastward of Jiew, and the 45 banks farther eastward are described on page 212.

Sajafi (Sayafi), an island, 405 feet (123^m4) high, lies about 7½ miles eastward of Tandjung Inggelang, with a clear passage in the fairway between, but there is a 39-foot (11^m9) patch lying nearly one mile westward of the north-western part of the island. Luwo, which is 50 lower than Sajafi, lies nearly one mile south-south-eastward of it; it is fringed by a drying reef, which extends about three-quarters of a mile from its south-eastern side.

Coast.—Anchorages.—The peninsula which forms the south-

Charts 943, 942a, 1263.

Chart 2788.

eastern side of Buli baai terminates in a hilly ridge at Tandjung Ngolopopo, a steep rocky point, situated about 25 miles south-south-eastward of Tandjung Inggelang. The most noticeable summit of the ridge is Goéba, 972 feet (296^m3) high, which, from north-eastward, appears as a small table mountain, situated about 3½ miles north-westward of Tandjung Ngolopopo; between them there is a hill, 533 feet (162^m5) high, which is fairly prominent.

The coast between Tandjung Inggelang and Tandjung Ngolopopo is very steep. The only places where vessels with local knowledge can obtain anchorage are in the small bight situated about 3½ miles southward of Tandjung Inggelang, in a depth of 13 fathoms (23^m8), where there are a few houses; off Kampung Paniti, close southward of Tandjung Lut, situated about 5 miles farther southward, where temporary anchorage may be obtained, in a depth of 13 fathoms (23^m8); and off Kampung Tepeleu and Kampung Gemia, situated about 12 and 10½ miles, respectively, north-westward of Tandjung Ngolopopo, in a depth of about 16 fathoms (29^m3).

Djailolo passage.—Djailolo (Jailolo) passage is the deep channel lying between Pulu Muor, an island, 280 feet (85^m3) high, which lies about 2½ miles south-eastward of Tandjung Ngolopopo, and Gébé, an island situated about 20 miles south-eastward.

Weilon, a rocky islet, lies on the drying reef which fringes the south-eastern extremity of Pulu Muor. Witimdi are two flat rocks, a few feet high, lying in the middle of the channel between Tandjung Ngolopopo and Pulu Muor, with a deep channel on either side of them.

From southward, Pulu Muor and the hill Goéba appear wedge-shaped, the steep side of each facing westward; as Goéba appears in view long before Pulu Muor, it may be mistaken for the island. When closer in, the eastern slope of Goéba may be mistaken for Tandjung Ngolopopo (*Lat. 0° 13' N., Long. 128° 54' E.*), and the 533-foot (162^m5) hill for Pulu Muor.

Charts 2788, 3248.

Gébé has a double-peaked hill, named El Fanum, 933 feet (284^m4) high, situated about 9½ miles south-eastward of Tandjung Sofa, the north-western extremity of the island; near its south-eastern extremity it attains an elevation of 1,297 feet (395^m3) in a peak in the shape of a truncated cone. See view facing page 87.

For further description of Gébé and islands south-eastward of it, see page 102.

Tidal streams.—In the vicinity of Tandjung Sofa there are strong tidal streams, with whirlpools and tide-rips, and also off the south-eastern extremity of Gébé, but here they are less strong. In the passage between Tandjung Ngolopopo and Pulu Muor the streams are sometimes very strong, and cause heavy tide-rips. During the transition periods of the monsoons, regular and moderate tidal streams, setting north-west and south-east, have been observed northward of Tandjung Ngolopopo.

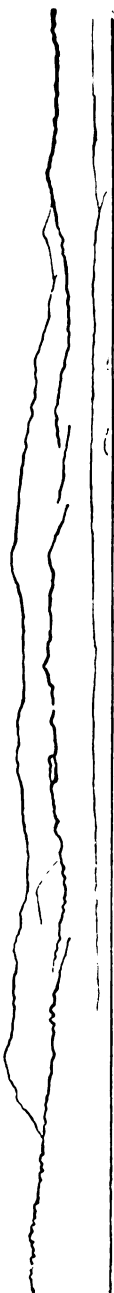
Chart 2788.

WEDA BAAI.—Weda baai is the largest indentation between the south-eastern and southern peninsula of Halmahera. Except for Veldman klip (page 99), situated north-eastward of the Widi eilanden, there are no dangers outside a distance of 6 miles from the shore.

Charts 942a, 1263.

To face page 97.

N.W. summit
of Waleh,
2,140 feet
↓



Baai van Kokka.—Karang Mela in line with the north-western summit of Waleh, bearing 047° .

(Original dated 1933.)



Weda baai.—Widi eilanden, bearing between 321° and 340° .

(Original dated 1933.)

Chart 2788.

Northern side of Weda baai.—Dangers.—The mountainous land on the northern side of Weda baai has been described on page 93. Tadjam can be easily identified from south-eastward, southward and south-westward. Bial can be identified by its steep western slope; 5 thence westward there is lower land as far as the high ridge which extends north-westward from Waleh gebergte. The so-called north-western peak of the Waleh gebergte (*see* view facing this page) is remarkable from south-westward owing to its steep north-western side. Westward of it and about 3 miles inland, is Sagea, 2,764 feet 10 (842^m5) high, which appears as a cube from south-eastward; on the coast, southward of it, there is a dark-coloured hill, 687 feet (209^m4) high, which shows up well and appears as an island when approaching from southward. This hill is one of the few landmarks which is unmistakable. About 4½ miles north-north-westward of Sagea is 15 Liember with two conical peaks, the higher of which has an elevation of 4,138 feet (1261^m3), but they are often obscured by clouds. Thence there is a valley behind the north-western extremity of the bay.

The coastal reef and the detached reefs, which dry, are marked by discoloration when the light is favourable; the water is always clear. 20 Karang Legli consists of two patches, with a depth of 6 feet (1^m8) over them, lying about 5 miles west-north-westward of Tandjung Ngolopopo and about 1½ miles off the northern shore.

Rede Patani or Gamsungi, situated off Kampung Patani, about 9 miles north-westward of Tandjung Ngolopopo, affords anchorage to 25 vessels with local knowledge, in a depth of about 30 fathoms (54^m9), with the small landing pier bearing about 315°, and the south-western extremity of Pulu Muor in line with the coast north-westward of Tandjung Ngolopopo (*Lat.* 0° 13' N., *Long.* 128° 54' E.), bearing about 117°. The village is not easy to identify from a distance, but on closing 30 it, a mosque with a white roof, behind a sandy beach, will be seen.

A shoal, with a depth of 6 feet (1^m8) over it, lies about 1½ cables offshore south-eastward of the mosque. About 1½ miles farther westward and 4 cables offshore there is a reef, which dries.

Communication with the shore is sometimes very troublesome 35 during the southerly monsoon; the passage through the coastal reef to the pier is narrow and local knowledge is essential for a boat to reach the pier, but there is a sheltered anchorage at all times in Rede Mesa and Baai van Kokka.

Between Kampung Patani and Kampung Mesa, situated about 40 30 miles west-north-westward, the coast is sparsely inhabited. Between Tandjung Remdi, situated 12½ miles west-north-westward of Kampung Patani, and Mesa there are a number of off-lying reefs, the outermost of which, Karang Mie (Mi), which dries, lying about 7 miles west-north-westward of Tandjung Remdi. About 5 miles north- 45 westward of the same point and about three-quarters of a mile offshore, is Karang Matalael, which dries; and about 2½ miles farther westward and about one mile offshore, is Karang Samlowos. A 3-foot (0^m9) patch lies about one mile south-eastward of the eastern extremity of Karang Samlowos. There is a clear deep channel between Karang 50 Mie and the reefs inside it.

Karang Mela, which dries, lies about 3 miles westward of Karang Samlowos and about one mile offshore. About half a mile north-eastward of Karang Mela there is a 5-foot (1^m5) patch.

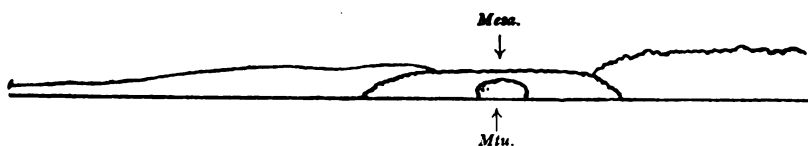
Charts 942a, 1263.

Chart 2788.

Between Tandjung Bone, situated about 9 miles north-westward of Tandjung Remdi, and Kampung Mesa, there are three hills near the coast, which are good marks, the westernmost and highest of which has an elevation of 926 feet (282^m2); this hill is the south-easternmost of three peaks, lying close together, of a densely wooded ridge.

Chart 2787, plan of Mesa road.

- Rede Mesa.—Directions.**—This roadstead, close eastward of Kampung Mesa affords anchorage, in a depth of about 14 fathoms (25^m6), sand. Mesa and Mtu are low islets, with high trees, from which reefs, which dry, extend southward, lying south-eastward of the village; these reefs are not always marked by discoloration when covered. The village is difficult to distinguish from the anchorage; it can be reached by boats through a narrow shallow channel between the coast and the islet Mesa.
- 15 A vessel should approach the roadstead with the 926-foot (282^m2) hill (chart 2788), mentioned above, bearing 330°, until the islet Mesa is in line with Mtu, bearing 280°, when she can steer along the coast to



Rede Mesa.—Mtu in line with Mesa,
bearing 280°.
(Original dated 1933.)

the anchorage. When the reefs can be plainly seen, the vessel may approach from southward and pass between the islets Mesa and Mtu.

20 *Chart 2787, plan of Kokka bay.*

- Baai van Kokka.—Dangers.**—This bay is entered between Tandjung Waleh, situated about 7 miles west-north-westward of Kampung Mesa, and a point about 3½ miles farther in the same direction. Kampung Sepa stands on the north-western shore, and at its eastern

25 end there is a conspicuous house.

- Karang Mela, which dries, lies about 2½ miles westward of Tandjung Waleh (Lat. 0° 26' N., Long. 128° 11' E.), and about one mile farther westward there is an 8-foot (2^m4) patch. There are two reefs which dry, lying within half a mile southward of the conspicuous house, and between them and the coast there is a clear deep channel. A 3-foot

- 30 (0^m9) patch lies about 2 cables eastward of the larger of the two reefs. Anchorage may be obtained in the vicinity of the reefs southward of Kampung Sepa, in depths of from 16 to 22 fathoms (29^m3 to 40^m2). During the southerly monsoon a calmer berth can be obtained in the north-eastern part of the bay, in similar depths, northward of Tête, a low island covered with mangroves, situated close offshore north-north-westward of Tandjung Waleh. Care must be taken to avoid the 15-foot (4^m6) patch, which is sometimes only slightly marked by discoloration, lying close northward of Tête.

40 *Chart 2788.*

Coast.—About 1½ miles westward of Sepa is Kampung Sagea, off which anchorage may be obtained by vessels with local knowledge during the northerly monsoon and transition periods, in a depth of about 19 fathoms (34^m7). A small mountain stream flows into the sea

Charts 942a, 1263.

Chart 2788.

here. Between Sagea and Tandjung Uli, a steep and rocky point, which lies about $7\frac{1}{2}$ miles westward; the coast is uninhabited.

Tidal streams.—The tidal stream sets westward along the northern shore of Weda baai with the rising tide, and eastward with the falling tide. 5

Western side of Weda baai.—The western side of Weda baai is, like the northern side, mountainous, and densely wooded. A number of shoals, not always marked by discoloration, lie off this coast, and consequently caution is necessary when approaching it. 10

Tandjung Libobo can be identified by the hill of the same name, 566 feet (172^m5) high, which stands about 2 miles within its extremity, and by Babi, a low wooded islet thickly covered with vegetation, situated close south-eastward of the point. About 30 miles north-westward of Tandjung Libobo there are two rounded mountains, 15 1,117 feet (340^m5) high. The mountains on the western side of the peninsula have been described on page 78. See view facing page 86.

Tidal streams.—The tidal streams along the western shore of Weda baai are weak in the northern part, but are stronger in the southern part and in the vicinity of the Widi eilanden. They set 20 northward with the rising tide, and southward with the falling tide. The streams in the vicinity of Tandjung Libobo may be strong, and when they are opposed by the wind, cause a rough sea.

Off-lying islands and dangers.—Widi eilanden, lying in the southern entrance of Weda baai, consist of several low islands, some of 25 which are covered with high trees and others with mangroves, lying on two extensive reefs, which dry, on the edges of which there are coral rocks, with white sand inside them. See view facing page 97.

The principal islands on the south-eastern reef are Vroolijk, Zand, and Drijvers, and on the north-western reef are Verloren, Schraal 30 and Muilijk. Vaarwel lies about 2 miles south-westward of the south-eastern reef, and Druvig lies close southward of Muilijk. There is a clear deep passage between the two reefs, and between them and Vaarwell and Druvig. There is no convenient anchorage, and there are no permanent inhabitants. 35

Veldman klip is a small coral reef, with a depth of 2 feet (0^m6) over it, always well marked by discoloration, lying about 8 miles north-north-eastward of Drijvers.

Coast.—Anchorages.—Between Kampung Gané di luar, situated about 19 miles north-westward of Tandjung Libobo (*Lat.* $0^{\circ} 55' S.$, 40 *Long.* $128^{\circ} 27' E.$), and Tandjung Foja (Foja), about 52 miles farther northward, there is a beach. Djodji (Joji), an islet lying close offshore, $16\frac{1}{2}$ miles north-north-westward of Kampung Gané di luar, is covered with coconut trees and is distinctive. About 3 miles north-eastward of it is Pulu Sunam, a rocky islet with high trees on it; it is infested 45 with large snakes and bats. Wamlonga, situated close offshore, about 11 miles north-north-westward of Djodji, is an islet covered with mangroves. Anchorage may be obtained by vessels with local knowledge anywhere along this coast, but it is advisable to approach on a westerly course. 50

Chart 2787, plan of Foja road.

Rede Foja.—Dangers.—This roadstead is situated off Kampung Foja, about $3\frac{1}{2}$ miles south-westward of Tandjung Foja. There are several reefs, which dry, fronting the village, of which Batjam

Chart 2787, plan of Foya road.

(Bacham) Sillum is the outermost. There are a number of patches, with depths of from 3 to 10 feet (0^m9 to 3^m0) over them, lying northward of the reefs, and some with depths of from one to 18 feet (0^m3 to 5^m5) over them, south-south-eastward of Tandjung Mafa, situated about 1½ miles southward of Kampung Foja.

Good anchorage may be obtained in the roadstead. A vessel approaching from eastward should not bring Tandjung Foja to bear less than 278° on account of the shoals eastward of that point, which consist of a 3-foot (0^m9) patch lying at a distance of about 2½ miles, and a 26-foot (7^m9) patch situated about 4 cables northward of it.

Small vessels may obtain a more sheltered anchorage northward of the tongue of coastal reef, which dries, inside the detached reefs, which dry. During the southerly monsoon, however, communication with the shore is frequently interrupted.

Chart 2788.

Coast.—Off-lying dangers.—The mountain peaks near the middle of the peninsula westward and north-westward of Foja have been described on page 66. Between Tandjung Foja and Tandjung Silota, situated about 10 miles northward, the coast is fringed by a drying reef, which extends three-quarters of a mile offshore in places, and there are a number of detached reefs, which lie as much as 5½ miles offshore. Karang Elmoos (Elmos), the easternmost, is an atoll, in the lagoon of which there is a depth of about 35 fathoms (64^m0). About midway between it and the coast is Karang Lle Heep. Karang Glop Mellopo lies about 4 miles south-south-eastward of Tandjung Silota and about 3 miles offshore. Karang Lle Glogos lies about 3½ miles south-eastward of the same point. There are other dangers inside these reefs, but there is a deep channel between them and the coast. Mof is a rock which lies on the coastal reef about 4 miles northward of Tandjung Foja, and is a good mark for vessels using this inshore passage.

When the reefs are plainly visible, vessels should proceed into and out of the inside passage by passing close southward of Karang Elmoos.

Tandjung Silota (*Lat.* 0° 17' N., *Long.* 127° 55' E.) is rocky on its northern side, and is rendered distinctive by the islet of the same name lying on the coastal reef close southward of the point. Several rocks lie close off the coastal reef within one mile south-eastward of the point.

Chart 2787, plan of Weda road.

Rede Weda.—Dangers.—Beacons.—This roadstead is situated off Kampung Weda, about 4 miles north-westward of Tandjung Silota. A flagstaff stands at the southern end of Kampung Weda. Kolo eilanden, the most important of which are Jef (Yef) and Kulefu, lie close offshore north-eastward of Kampung Weda. Jef is saddle-shaped, the northern peak being 313 feet (95^m4) high, and steep on its western side. The eastern side of Jef is fringed by a reef, which dries; on the south-eastern side of this reef there is a rock and on its north-eastern side there are two islets. The southern edge of the reef is marked by three unofficial beacons, surmounted, respectively, by a rectangle, a cylinder and a ball.

Kulefu, which lies about half a mile south-westward of Jef, is 169 feet (51^m5) high, and covered with coconut trees; it is fringed by a reef, which dries, the edges of which are marked by a number of unofficial beacons.

A reef, with a depth of 3 feet (0^m9) over it, marked by discoloration,

Charts 942a, 2759a, 1263.

Chart 2787, plan of Weda road.

lies $6\frac{1}{2}$ cables south-eastward of Kulefu, and two reefs marked by unofficial beacons lie within 3 cables southward of the island.

A reef, which dries and is marked by a beacon surmounted by a square, lies nearly 8 cables south-south-westward of Kulefu. 5

The shore reef off Kampung Weda is marked by two unofficial beacons, each surmounted by a ball.

Teluk Maidi, in which lies Maidi, a low islet fringed by a reef which dries, in the bight between Jef and the mainland; there is a deep channel on either side of the islet. The edge of the reef, which dries, 10 extending from the western side of the entrance to Teluk Maidi is marked by unofficial beacons. A rock, covered with vegetation, lies on the extensive coastal reef, which dries, about half a mile north-north-westward of Maidi.

The limits of the roadstead are the parallels through the southern 15 point of the islet Maidi, and the point 3,281 feet (1000^m0) southward of the flagstaff, and the meridian through the eastern extremity of Jef.

Teluk Gaah, northward of Jef, is approached through a narrow channel in the coastal reef, on which there are several islets. Fronting its entrance there is a coral reef, with a depth of 3 feet (0^m9) over it. 20 The shores of the bay are covered with mangroves. The bay can only be entered at low water or when the reefs are plainly visible.

Chart 2788.

Off-lying danger.—Karang Pasir Tidore, which dries, lies about 5 miles north-eastward of Tandjung Silota. A reef, with a depth of 25 6 feet (1^m8) over it, lies about $1\frac{1}{2}$ miles westward of Karang Pasir Tidore.

Charts 2787, plan of Weda road, 2788.

Anchorage.—**Directions.**—Anchorage may be obtained in Rede Weda, in a depth of about 19 fathoms (34^m7), coral, southward of 30 Kulefu, with the rock on the coastal reef, which dries, north-north-westward of Maidi, bearing about 004° , just open westward of the western extremity of Kulefu, but this berth is exposed to the southerly monsoon.

Small vessels will find better shelter between Kulefu and the coast, 35 opposite the landing pier, in a depth of about 8 fathoms (14^m6); this anchorage may be approached from northward or southward of Kulefu (*Lat.* $0^\circ 20' N.$, *Long.* $127^\circ 53' E.$).

As Kolo eilanden only show up against the coast in the afternoons, the only landmark for making the roadstead in the morning is the 40 2,117-foot (645^m3) peak, situated about 8 miles westward of Jef, which is very distinctive from eastward. There is a chain of five hills, ranging from 684 to 1,255 feet (208^m5 to 382^m5), in the foreground westward of Weda, but they can only be distinguished about the same time as Kolo eilanden. Lenggua, the highest peak on the western 45 side of the peninsula, situated about 10 miles westward of Tandjung Silota, can be seen over these hills.

To pass northward of Karang Pasir Tidore a vessel should steer 270° for the steep slope of the 2,117-foot (645^m3) peak, mentioned above, until Tandjung Foja bears 191° , thence she should alter course south-westward and steer for the southernmost and highest of the five hills westward of Weda, bearing 244° , until the warehouse on the beach northward of Kampung Weda is open south-westward of Kulefu, bearing about 313° , when she should steer for the anchorage, passing

Charts 942a, 1263.

Charts 2787, plan of Weda road, 2788

south-westward of the 3-foot (0^m9) patch south-eastward of Kulefu.

To pass southward of Karang Pasir Tidore, a vessel should steer for the steep slope of the 2,117-foot (645^m3) peak, bearing 287°, and when
5 abeam of that reef steer for the anchorage.

Chart 2787, plan of Weda road.

A vessel intending to enter Teluk Maidi from eastward should keep the northern extremity of Kulefu in line with the warehouse northward of Kampung Weda, bearing 279° until the western extremity of
10 the islet Maidi is in line with the rock lying on the coastal reef, bearing 342°, when she should alter course northward and keep these marks in line, which leads close eastward of the beacon marking the outer edge of the tongue of reef extending from the western side of the entrance; care should be taken not to open the rock westward of the islet.

15 A vessel approaching from southward should keep the same leading marks in line bearing 342°, which leads about one cable westward of the 3-foot (0^m9) patch situated south-eastward of Kulefu.

Charts 2788, 3248.

ISLANDS SOUTH-EASTWARD OF HALMAHERA.—Gébé.

20 —For the general aspect of Gébé, *see* page 96. The south-western coast is covered with mangroves; Tandjung Ubulié, which lies about 10 miles south-eastward of Tandjung Sofa, is rocky and steep, and Tandjung Tuli Kalio, situated about 7 miles farther south-eastward, rises within to a steep hill, 848 feet (258^m5) high, with some casuarina
25 trees on its summit. Between these two points is Fau, an islet with a conical hill, 418 feet (127^m4) high, of a reddish colour, at its southern end. *See* view facing page 87.

At the southern extremity of Gébé is Boki Nanasi, 622 feet (189^m6) high, and covered with grass.

30 The only inhabited places on the north-eastern coast are the villages Sanafi and Katjepi adjoining one another, situated about 7 miles from the south-eastern extremity; they are mostly hidden in coconut plantations. There are openings in the reef which fringes the island, on both sides of the villages, through which a landing can be effected
35 when the surf is not too heavy. A small rocky islet lies close north-westward of Sanafi.

Tidal streams.—For tidal streams off the north-western and south-eastern ends of Gébé, *see* page 96. At springs, the tidal streams in the vicinity of Fau, and particularly between Fau and Gébé, are
40 strong.

Anchorage.—Anchorage may be obtained by vessels with local knowledge in the channel northward of Fau, where there is good shelter although there may be a tidal stream here. There is a small detached reef, which dries, with a small sandy patch on its eastern extremity,
45 which can be plainly seen, lying on the southern side of the fairway in the entrance; the Gébé coast should be followed at a distance of from 1½ to 1¼ cables. The entrance southward of Fau can only be used when the reefs in it can be plainly seen. The lagoon, entered on the northern side of Fau, is only accessible for small vessels with local
50 knowledge.

Anchorage may be obtained by vessels with local knowledge, in a depth of 16 fathoms (29^m3), in the bight between the southern end of Fau and Tandjung Tuli Kalio (*Lat.* 0° 08' S., *Long.* 129° 28' E.).

Charts 2759a, 1263.

Charts 2788, 3248

There is anchorage for vessels with local knowledge, in a depth of about 33 fathoms (60^m4), in Ingalan, a bight at the southern extremity of Gébé, and also in the bight close eastward of it, off Kampung Umera. 5

Vessels with local knowledge may obtain anchorage off Kampung Sanafi, in a depth of about 22 fathoms (40^m2), about half a cable offshore; the coast here is steep-to.

Chart 3248.

Ju.—Uta.—Anchorages.—Ju, 182 feet (55^m5) high, and Uta, 10 which is low, are islands covered with moderately high vegetation and coconut plantations, lying within 10 miles north-eastward of Gébé. They lie about 1½ miles apart, with a channel which is deep and free from dangers in the fairway, between, but it is narrowed to about half a mile in width by a reef, usually marked by discoloration, with a 15 depth of 26 feet (7^m9) at its outer edge, which extends about 1½ miles south-eastward from Uta. There is a deep and clear channel between Gébé and Ju.

On the south-western side of Ju, which is partly rocky, is Kampung Omnia, close north-westward of which anchorage may be obtained by 20 vessels with local knowledge; the bottom is too steep for anchoring immediately off the village, and the tidal stream may be strong. The lagoon, on the southern side of the island, is accessible for boats. (*Lat.* 0° 3' S., *Long.* 129° 38' E.).

Anchorage may be obtained in favourable weather off the south- 25 western end of Uta, in a depth of 35 fathoms (64^m0) about one cable from the shore, with the western point of the island bearing 005° and the southern point 083°.

Uta is uninhabited; both islands are infested by offensively virulent mosquitoes. 30

Chart 3745.

Gag.—Dangers.—This island, which lies about 22 miles south-eastward of Gébé, is 1,143 feet (348^m4) high on its south-western side. The western coast is rocky and steep, but the northern and eastern coasts must be given a good berth. The northern part of the island is 35 the most densely covered with vegetation. The island is uninhabitable on account of the myriads of stinging gnats.

A 6½-fathom (11^m9) patch lies about three-quarters of a mile off the northern side of the island, and a 5½ fathom (10^m1) patch lies about 2 miles south-eastward of the north-eastern point. Madjet (Majet) 40 is a rock above water, on which there are some large trees, lying on the fringing reef, which dries, about 2 miles southward of the same point. A shoal with a depth of about 2 fathoms (3^m7) over it, lies about 6 cables westward of Madjet, in the entrance to an inlet. Visschers bank, with depths of from one to 6½ fathoms (1^m8 to 11^m9) 45 over them, lie within 1½ miles of the south-eastern extremity of the island.

Jef Doif.—Dangers.—Jef (Yef) Doif, or Poelau Bamboe, consisting of Klaarbeek (Klarbek), Schoterog, Vlaming and Kommerrust, all uninhabited islands, lies about 17 miles southward of Gag. Klaarbeek 50 is 365 feet (111^m2) high and rocky, with steep sides. A shoal, with a least depth of 2½ fathoms (5^m0) over it, lies close southward of the island, and a 4½-fathom (8^m7) patch lies about 6½ miles north-north-westward.

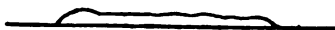
Charts 942b, 2759a, 1263.

Chart 3745.

Klaarbeek, bearing 248° , 13 miles.
(Original dated 1933.)

Schoteroog (*Lat. $0^{\circ} 51' S.$, Long. $129^{\circ} 46' E.$*) and Vlaming, situated about 4 and 7 miles, respectively, south-south-westward of Klaarbeek, are low coral islets covered with vegetation, and bordered by a sandy beach; there is a knob-shaped tree on Vlaming. A 6-fathom (11^m0) patch lies about 2 miles westward of Vlaming.

Kommerrust is a low coral islet, covered with vegetation, with a square tree on it, lying about $7\frac{1}{2}$ miles eastward of Schoteroog.



Kommerrust, bearing 203° , 3 miles.
(Original dated 1933.)

Two shoals, with depths of 7 and $4\frac{1}{2}$ fathoms (12^m8 and 7^m8) over them, lie about $3\frac{1}{2}$ and $5\frac{1}{2}$ miles, respectively, eastward of Schoteroog.

For Jef Fam group, see page 219, and Kofiau, see page 119.

CHAPTER III

CERAM SEA

Chart 942a, b.

CERAM SEA.—The accepted limits of the Ceram sea are as follows:—

On the north and north-east.—A line drawn from Tandjung Dehekolano (*Lat. 1° 49' S., Long. 126° 30' E.*), the eastern extremity of Sula eilanden, to the western extreme of Obi Major, along its southern coast to its eastern extreme and thence through the islands of Tobalai, Kekek, Pisang and Kofiau to Tandjoeng Sele, the western point of New Guinea (*Lat. 1° 26' S., Long. 130° 55' E.*), down the coast to Karoefa (*Lat. 3° 52' S., Long. 133° 27' E.*). 5

On the south-east.—A line from Karoefa to the south-eastern extreme of the island Adi, thence to Tandjung Borang, the northern point of Nuhu Tjuk (Chut) (*Lat. 5° 17' S., Long. 133° 09' E.*). 10

On the south-west and south.—A line from Tandjung Borang through the Watubela and Gorang eilanden to the south-eastern extreme of Ceram, along its northern coast to Tandjung Tanduru Besar, the north-western point, thence to Tandjung Batu Nuhan, the northern extreme of Buru and along the coast to Tandjung Palpetu, the north-western point of the island (*Lat. 3° 06' S., Long. 126° 06' E.*). 15

On the west.—A line from Tandjung Palpetu to Tandjung Waka, the southern point of Sanana, through this island to its northern point, thence across Straat Mangoli to the southern coast of Mangoli, and thence along the coast to Tandjung Dehekolano. 20

Chart 3241.

SULA EILANDEN.—This group consists of the mountainous, but sparsely cultivated islands, Taliabu, Mangoli and Sanana, which lie together with a number of islets, eastward of Celebes. 25

The climate is favourable; there are no unhealthy districts except the coastal marshes.

Taliabu is described in Eastern Archipelago Pilot, Vol. II. 30

Chart 3440, plan of Tjapaloeloe strait and Vesuvius bay.

Straat Tjapalulu.—**Dangers.**—Straat Tjapalulu, between Taliabu and Mangoli, is a deep but narrow passage, and, notwithstanding the strong tidal streams, is navigable for large vessels. Tandjung Ndoludeu, on the western side of the southern entrance, is described in Eastern Archipelago Pilot, Vol. II; Tandjung Ndoluselagi, situated about three-quarters of a mile north-eastward of Tandjung Ndoludeu, is low, thickly wooded, and noticeable owing to a large rock on the coastal reef, which dries, close off it. Tandjung Sakomata, situated 35

Charts 942a, 2759a, 1263.

Chart 3440, plan of Tjapaloeloe strait and Vesuvius bay.

on the eastern side of the southern entrance, is low, but is covered with large trees; Tandjung Batu Gossok is a very prominent rocky point which lies about one mile north-westward of Tandjung Sakomata, the coast between them is bordered by a sandy beach. Both shores northward of Tandjung Batu Gossok are wooded to the water's edge.



Straat Tjapalulu from northward.

(Original dated 1933.)

Although the fairway through Straat Tjapalulu is very narrow in the southern part it is deep throughout except for two patches in the middle of the southern entrance with depths of about 10 fathoms (18^m3) over them. The following dangers lie on either side of the fairway:—

A 19-foot (5^m8) patch lies about 1½ cables north-westward of Tandjung Batu Gossok, and a 7-foot (2^m1) patch close off the western shore west-north-westward of this point. A reef, with a least depth of 5 feet (1^m5) over it, lies about 2 cables off the eastern shore and about 6 cables southward of Tandjung Gina (*Lat.* 1° 50' S., *Long.* 125° 20' E.), situated about 2½ miles northward of Tandjung Batu Gossok. Three patches, with depths of from 49 to 56 feet (14^m9 to 17^m1) over them, lie in the northern part of the strait, off the entrance to Baai van Dofa, on the Mangoli shore.

Tandjung Fatukombu and Tandjung Wajteja, the western and eastern entrance points, respectively, of the northern end of the strait, are rocky.

Tidal streams.—The tidal streams in Straat Tjapalulu are of a mixed character, but the semi-diurnal stream predominates, as shown by the table below.

The maximum rates of the north-going streams of the diurnal and semi-diurnal tides may fall together, and a maximum rate of about 9½ knots may thus be expected in this direction; this occurs in May and June at 1600, and in November and December at 0400, during the semi-diurnal spring tides. The maximum rate of the south-going stream may attain a rate of about 6 knots, during the semi-diurnal

Semi-diurnal tides.	spring tide 3½ days after full and new moon; maximum rate 6 knots. neap quarter 3½ knots.	
	maximum rate at spring tides } N. at 0400 and 1600 { from 6 days before to 6 days after spring tides; S. at 1000 and 2200 { 45 min. later each day. With neap tides 6 hrs. later than at spring tides.	
Diurnal tides	spring tide one day after the moon's greatest declination; maximum rate 3½ knots. neap declination 0° 0 knot.	
	maximum rate N. 1st Jan. at 0130 1st July at 1330; half an hour earlier each week. S. 1330 0130	

spring tides. With semi-diurnal neap tides in May and June, and in November and December, the maximum rate during the day, of either the north-going or the south-going streams, will not appreciably exceed 3 knots, and the same applies to the remaining months of the year.

Charts 942a, 1263, 2759a.

Chart 3440, plan of Tjapaloeloe strait and Vesuvius bay.

The period of slack water is sometimes of short duration; the greater the maximum rate of the stream before and after slack water, the shorter the period of slack water. The changes in the direction of the tidal streams occur simultaneously in the middle of the strait 5 and under the shores.

Owing to the irregular nature of the bottom in the middle and southern parts of the strait, there are heavy whirlpools and ripples when the tidal streams are strong, often seriously affecting the steering of a vessel; these do not occur in the northern part of the strait. 10

Anchorage.—Directions.—Vessels from southward awaiting a favourable opportunity of passing through the strait can anchor in the bight between Tandjung Sakomata and Tandjung Batu Gossok, in a depth of 23 feet (7^m0), where they will lie out of the strong tidal streams.

At the northern end of the strait anchorage can be obtained off the 15 entrance to Baai van Dofa. A spit, with a least depth of 13 feet (4^m0) over it, extends from the southern side of the inner part of this bay, otherwise it is clear between the 5-fathom (9^m1) lines on either side. The shores of the bay are covered with mangroves.

A vessel from southward should steer for Tandjung Batu Gossok 20 with the strait open and pass Tandjung Ndoluselagi at a distance of about 2½ cables; thence she should steer to pass the same distance from Tandjung Batu Gossok and then continue on a course parallel with the Taliabu shore until within about one mile of Tandjung Gina (Lat. 1° 50' S., Long. 125° 20' E.) when she should gradually close the 25 Taliabu shore, and pass the point opposite Tandjung Gina at a distance of about 1½ cables; thence she can steer out of the strait, keeping in the eastern half.

A vessel making for the strait northward will have no difficulty in identifying the somewhat reddish, rocky Tandjung Fatukombu; 30 the strait can then be opened, and the directions previously given followed in the reverse order.

Before proceeding through the strait, the description of the tidal streams given above should be consulted, so as to ascertain the direction and rate of the tidal stream that may be expected. 35

Vesuvius baai.—This bay is situated in the western part of the bight entered between Tandjung Sakomata and Tandjung Batu Kapitan (chart 3241), which lies about 6 miles east-south-eastward. The latter point is high and rocky, and is outstanding from a distance eastward and westward; a prominent pillar-shaped rock lies close off 40 the point on the narrow drying coastal reef.

Vesuvius baai is fronted by Pasi Ipah, an islet which can be identified by its hilly western peak, on which a dense clump of trees projects above the remaining vegetation. Kampung Pasi Ipah, on the northern side of the island, stands on a sandy beach in the middle of a coconut 45 plantation; elsewhere its coasts are muddy and covered with mangroves. A channel in the drying reef, which fringes the island, gives access to a landing pier near a mosque and flagstaff. This channel which is marked by stakes, has depths of from 6 to 9 feet (1^m8 to 2^m7) in it, and at the head of the pier there is a depth of 5 feet (1^m5). 50

About 1½ miles eastward of Pasi Ipah is Kena, an islet, which shows plainly against the mountainous background, due to its bright sandy beach. The reef which fringes the island, extends as much as 6 cables from its south-western side.

Charts 942a, 1263, 2759a.

Chart 3440, plan of Tjapaloeloe strait and Vesuvius bay

At Kampung Lipo and Kampung Unabensia, about three-quarters of a mile northward, situated on the western side of the bay, there are sandy beaches in the mangrove which borders this side of the bay, 5 behind which are extensive coconut plantations reaching to the slopes inland. There is a small pier on the reef, which dries, at Lipo, which can be reached at high water. The head of the bay is muddy and fringed with mangroves.

Anchorage.—Anchorage may be obtained on both sides of Pasi 10 Ipah and Kena (*Lat.* $1^{\circ} 53' S.$, *Long.* $125^{\circ} 25' E.$), in depths of about 20 fathoms (36^m6) and 16 fathoms (29^m3), respectively. With southerly winds there is more shelter in Vesuvius baai.

Chart 3241.

Mangoli.—Both the western and eastern parts of Mangoli are 15 mountainous; the mountains in the western part, unlike those in Taliabu, afford good landmarks. The most prominent peaks are those of the Auponhia gebergte, situated about 7 miles east-north-eastward of Tandjung Batu Kapitan, which are 2,038 and 2,143 feet (621^m2 and 653^m2) high, and the 3,446-foot (1050^m3) peak of Buaja 20 gebergte (Buya mountains), which stands about 12 miles east-north-eastward of the same point; the depression between these two ranges is very noticeable. The peaks of Loku gebergte, which attain an elevation of 3,761 feet (1146^m4), situated about 18 miles from the eastern extremity of the island, are not easy to identify. See view 25 facing page 114.

Northern side of Mangoli.—Coast.—The only dangers off this coast in depths of over 10 fathoms (18^m3) are in the vicinity of the Tabulu eilanden and between these islands and Koro, which lies about 8 miles farther eastward. Thence to the eastern end of the 30 island vessels can pass relatively close to the coast, the only known danger being a 2-foot (0^m6) patch, lying about half a mile offshore, about 4 miles eastward of Tandjung Lampau. See page 109.

The tidal streams possibly set eastward and westward along the coast. During the survey, at the height of the South-east monsoon, a calmer 35 sea was experienced off the north coast, than was found off the south coast during the North-west monsoon. During the latter there was a troublesome sea for small vessels off the north coast.

From Tandjung Wajteja (Wayteya), the eastern entrance point of the northern end of Straat Tjapalulu, to the vicinity of the Tabulu eilanden, 40 situated about $8\frac{1}{2}$ miles eastward, the coast is low. It is marshy in the vicinity of Baai van Dofa, and Tandjung Wajteja is rocky; eastward of this point there is a sandy beach, except in the bays and inlets. Liku, situated about 3 miles east-north-eastward of Tandjung Wajteja, is a low wooded islet. The eastern of the Tabulu eilanden is hilly on 45 its southern side. The passage between these islands and the coast of Mangoli is encumbered with dangers.

A rock, with a depth of 5 feet (1^m5) over it, and a one-foot (0^m3) patch lie, respectively, about one mile and 2 miles eastward of the Tabulu eilanden; a ridge, at the north-western end of which there 50 is a patch which dries and at the south-eastern end a patch with a depth of about 2 feet (0^m6) over it, lies about 6 miles eastward of the same islands.

Vessels are cautioned not to pass between the Tabulu eilanden and the one-foot (0^m3) patch.

Charts 942a, 2759a, 1263.

Chart 3241.

Koro, a low island covered with vegetation, is situated about 9 miles eastward of the Tabulu eilanden.

Eastward of the Tabulu eilanden the coast has a different aspect from that westward; it is more rocky and the prominent headlands are steeper. 5

See view facing page 114.

Mentjeri (Mencheri), situated close offshore and about $4\frac{1}{2}$ miles east-south-eastward of Tabulu eilanden, is a low islet, thickly covered with vegetation. Close offshore, about 2 miles westward and three-quarters 10 of a mile eastward, respectively, of Tandjung Lampau, a low point, situated about 10 miles eastward of Mentjeri, are the low islets Pui and Dodoku, thickly covered with vegetation.

Anchorage.—Anchorage may be obtained by vessels of shallow draught with local knowledge, at the head of the bay, which is bordered with mangroves, entered between Liku and Tandjung Fatupira (Lat. $1^{\circ} 46' S.$, Long. $125^{\circ} 28' E.$), situated about $2\frac{1}{2}$ miles eastward, in a depth of 23 feet (7^m0), south-eastward of two low islets, covered with vegetation. Kampung Liku, situated on the western side near the entrance, was the only village, in 1930, on the almost uninhabited 20 northern coast of Mangoli.

Good anchorage over a mud bottom, may be obtained in the bight eastward of Tandjung Falabisahaja, situated about $1\frac{1}{2}$ miles eastward of Tandjung Fatupira.

Between Tabulu eilanden and Tandjung Lampau, anchorage may be 25 obtained anywhere off the coast during the South-east monsoon and the transition periods.

Coast.—**Anchorage.**—Between Tandjung Lampau and Tandjung Pandara, the eastern extremity of Mangoli, spurs from the mountains slope down to the coast, where it is in many places high and rocky. 30 The only danger off this coast is a rock, with a depth of 2 feet (0^m6) over it, situated about 4 miles eastward of Tandjung Lampau. Pulu Tabobi, situated about 9 miles westward of Tandjung Pandara, is a large rock, which, although lying on the coastal reef, is clear of the rocky point, with reddish-brown vertical cliffs from 130 to 165 feet 35 (39^m6 to 50^m3) high. About $3\frac{1}{2}$ miles farther eastward is Pulu Fatsati, another remarkable rock lying on the coastal reef which dries. Close off Tandjung Pandara there is an islet with high, sharply defined sides, on which there is a clump of casuarina trees, lying on the coastal reef. 40

Anchorage may be obtained anywhere off this stretch of coast, but it is necessary to anchor close offshore in places. There are a few temporary settlements along this coast.

Southern side of Mangoli.—**Coast.**—Between Tandjung Batu Kapitan (page 108) and Tandjung Fargata, a high and rocky point, 45 lying $5\frac{1}{2}$ miles eastward, the coast is very steep, but thence to Tandjung Kedafota, situated $16\frac{1}{2}$ miles farther eastward, it is less so and is bordered by an almost unbroken sandy beach. Pulu Sambiki is a high steep and prominent islet lying about half a mile southward of Tandjung Kedafota, which latter also appears as an islet from westward. There 50 is a clear channel, $2\frac{1}{2}$ cables wide, between them, but a ridge of reefs, on which there are two patches which dry, extends from the islet to Kampung Kaporu, which latter is distinctive on account of its coconut plantation, lying about $3\frac{1}{2}$ miles westward.

Charts 942a, 2759a, 1263.

Chart 3241.

The shores of the bight entered between Tandjung Kedafota and Tandjung Botu, a low sandy point, situated 8 miles eastward, are steep, rocky and covered with vegetation in its western part to a position northward of Nofanini, an islet lying close offshore about one mile north-eastward of Tandjung Kedafota, thence to Tandjung Botu it is sandy. Between Kampung Tjapalulu (Chapalulu), lying about $4\frac{1}{2}$ miles eastward of Nofanini, and Tandjung Botu, about 3 miles south-eastward, there are coconut plantations. Kampung Ufola, which stands about midway between Tjapalulu and Tandjung Botu, with a small pier, is easy to identify.

Off-lying dangers.—Two reefs, one with a depth of 11 feet (3^m4) over it, and the other with 2 feet (0^m6) over it, lie about 2 miles north-eastward and $2\frac{1}{2}$ miles east-south-eastward, respectively, of Pulu Sambiki (*Lat. $1^{\circ} 56' S.$, Long. $125^{\circ} 47' E.$*).

Tidal streams.—Tidal streams set along the southern side of Mangoli. Eddies have been observed off the headlands.

Anchorage.—Anchorage may be obtained between Tandjung Batu Kapitan and Pulu Sambiki during the northerly monsoon, anywhere except off the steep rocky points, but it is inadvisable during the southerly monsoon. Vessels with local knowledge can safely proceed through the channel between Pulu Sambiki and Tandjung Kedafota, and obtain good anchorage in two small bights close westward of the point. Anchorage may be obtained anywhere between Pulu Sambiki and Straat Mangoli.

Straat Mangoli.—**Danger.**—This strait, between the southern side of Mangoli, in the vicinity of Tandjung Botu, and the northern end of Sanana, an island lying 2 miles southward, is deep in the fairway, except for a 23-foot (7^m0) patch lying about three-quarters of a mile southward of Tandjung Botu. About $2\frac{3}{4}$ cables off the northern shore about $1\frac{1}{2}$ miles north-eastward of Tandjung Botu, there is a shoal, with a least known depth of 3 fathoms (5^m5) over it, but as it has not been thoroughly examined, there may be less depths.

The northern coast of Sanana is muddy, bordered with mangroves, and fringed by a reef, which dries, extending as much as 8 cables offshore.

Tidal streams.—The tidal streams in Straat Mangoli may attain a rate of from 3 to 4 knots, and there may be eddies in the vicinity of, and especially southward of, the 23-foot (7^m0) patch lying southward of Tandjung Botu. The tidal stream sometimes sets on to the reef extending from the north-eastern side of Sanana.

Directions.—A vessel proceeding through Straat Mangoli from westward should keep Pulu Sambiki astern, bearing 270° , which leads northward of the 2-foot (0^m6) patch, which is not marked by discoloration, situated east-south-eastward of that islet, and pass about $2\frac{3}{4}$ cables southward of Tandjung Botu; thence clear of the reef extending from the north-eastern side of Sanana; when Tandjung Wakapara, the north-eastern extremity of Sanana, is in line with Tandjung Kabua, situated about 2 miles southward, bearing 180° , course may be altered as required.

Coast.—**Off-lying danger.**—**Anchorage.**—The coast between Tandjung Botu and Tandjung Kausigi, situated about 14 miles east-north-eastward, is low and sandy. There are coconut trees and several villages, most of which have a small pier, between Tandjung

Chart 3241.

Botu and Tandjung Gohadjodjara, 19 miles east-north-eastward. The latter point is the westernmost of a succession of rocky points extending to the eastern end of the island. Anchorage may be obtained anywhere off this stretch of coast. 5

A rock, with a depth of 2 feet (0^m6) over it, lies about 2 miles south-south-westward of Tandjung Gohadjodjara.

Straat Lifumatola.—Dangers.—This strait, between the eastern end of Mangoli and Lifumatola, the easternmost of the Sula eilanden, is encumbered with islets and dangers, and should not be used by vessels without local knowledge. The tidal streams in the strait are strong, there are whirlpools and eddies over the banks and shoals, and during the southerly monsoon there is a troublesome sea. There is only a short period of slack water. 10

Pagama (*Lat.* 1° 50' S., *Long.* 126° 20' E.), an islet lying on a reef, which dries, in the southern entrance of the strait, is low, but is covered with high coconut trees; about three-quarters of a mile north-north-eastward of it is Nini, an islet lying in the middle of the strait near its narrowest part. A shallow bank extends 3½ cables south-westward from Nini. 15

Lifumatola.—Anchorage.—This island, which is uninhabited, is 844 feet (257^m2) high, and rises moderately steeply. Limo, a prominent rocky islet, lies close off the south-eastern side of the island, about one mile south-westward of Tandjung Dehekolano, its eastern extremity, and abreast it is a remarkable limestone cliff. Tandjung Dehekolano can also be identified by its white limestone rocks. *See* view facing page 114. 20

Strong tidal streams, setting northward and southward round the eastern end of the island, cause heavy tide rips for a distance of one mile offshore, and when the wind and stream are opposed there is a heavy sea in depths of less than 110 fathoms (210^m2). A strong tidal stream also sets along the northern and southern sides of the island. 30

Anchorage may be obtained by vessels with local knowledge, in a depth of 44 fathoms (80^m5), during the North-west monsoon and transition periods, in Djiko Kahiamasolo, the southernmost of three narrow inlets lying northward of Tandjung Dehekolano, about 1½ cables from the coastal reef extending from the northern side of the inlet. Only the outer part of Djiko Loleopapu, situated close northward of Djiko Kahiamasolo, is accessible. 40

Sanana.—This mountainous island has several prominent peaks on a ridge extending northward and southward, and which slopes steeply to the eastern and western coasts, forming sharply defined and almost vertical clefts. The summit, which stands about 5 miles from the southern extremity, is 2,222 feet (677^m3) high, and about 3½ miles from the northern extremity there are two peaks, 1,746 and 1,281 feet (532^m2 and 390^m5) high, with a distinctive tree on the latter. 45

The coast is mostly low, with sandy beaches and coconut plantations interspersed in places with rocky points, but can be approached closely except along the northern half of the western side, and in Straat Mangoli. 50

The tidal streams around the island are moderately strong.

Western side of Sanana.—Dangers.—Anchorages.—There are coconut plantations along the whole of the west coast. A drying reef

Charts 942a, 2759a, 1263.

Chart 3241.

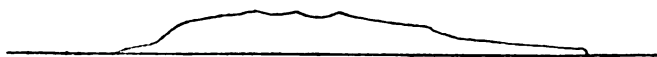
extends about half a mile from the north-western side of the island, and at Kampung Molbufa, situated about $3\frac{1}{2}$ miles south-south-westward of Tandjung Kuma, the northern extremity of the island, there is an opening in this reef which is accessible for small vessels with local knowledge, but there is a shoal, with a depth of 2 feet (0^m6) over it, barely marked by discoloration, off the entrance. There is a small pier at the village.

Temporary anchorage may be obtained by vessels with local knowledge south-westward of the entrance to this opening, about $2\frac{1}{2}$ cables outside the drying reef, in a depth of about 6 fathoms (11^m0), with the flagstaff in Kampung Molbufa bearing about 111° , and the point abreast Kampung Fokalik, situated 3 miles south-south-westward, 194° . Two shoals, with depths of 17 and 23 feet (5^m2 and 7^m0) over them, lie about half a mile offshore southward of this anchorage, and south-westward of a distinctive rocky cliff fringed by a wide beach, situated about $6\frac{1}{2}$ cables south-westward of the landing pier at Molbufa. A vessel proceeding northward from this anchorage should keep well outside the coastal reef when the east-going stream is setting into Straat Mangoli.

A 2-foot (0^m6) patch lies about half a mile offshore abreast Kampung Fokalik. Tandjung Fatparoma (*Lat. $2^\circ 06' S.$, Long. $125^\circ 51' E.$*), situated about $1\frac{1}{2}$ miles southward of Fokalik, is rocky, but Tandjung Patahoj, which lies $7\frac{1}{2}$ miles farther southward, is low and marshy. A chain of reefs, with depths of from 6 to 26 feet (1^m8 to 7^m9) over it, extends $5\frac{1}{2}$ miles north-north-westward from the latter point.

At Kampung Kabau, situated about $1\frac{1}{2}$ miles northward of Tandjung Patahoj, there is a shallow lagoon, with a bridge across its narrow entrance. Anchorage may be obtained within half a mile northward of it, taking care to avoid the reefs mentioned above, which are barely marked by discoloration.

Between Tandjung Patahoj and Tandjung Waka, the low southern extremity of the island, the depths are too great for anchorage. Eddies may be experienced off Tandjung Waka.



South-eastern point of Sanana, bearing 359° ,
16 miles.
(Original dated 1933)

Eastern side of Sanana.—Coast.—Between Tandjung Sakita, which lies about $1\frac{1}{2}$ miles eastward of Tandjung Kuma, and Kampung Poheu, situated about $2\frac{1}{2}$ miles south-eastward of Tandjung Sakita, the coast is muddy and fringed with mangroves, and a drying reef extends as much as one mile offshore. At Poheu there is a large mosque standing on posts. In the coastal reef there are two openings accessible to small craft with local knowledge, one entered about $1\frac{1}{2}$ miles eastward of Tandjung Sakita, and the other abreast Kampung Poheu. The tidal streams in this vicinity are strong, and vessels are recommended to give it a wide berth.

Chart 930, plan of Baai van Sanana.

Baal van Sanana.—Beacons.—Anchorage.—This bay, entered between Tandjung Kabau and Tandjung Bega, situated about 6 cables

Charts 942a, 2759a, 1263.

Chart 930, plan of Baai van Sanana

south-south-westward, is the principal anchorage off the island.

The entrance is marked by two beacons standing on the edge of the foul ground which extends from the reefs, which dry, on either side; that on the southern side is surmounted by a black truncated cone. 5

At the head of the harbour is Kampung Sanana, in which there is a large mosque and a small pier with a depth of 2 feet (0^m6) at its head. Northward of the village there is a small mole, and southward of it a shed.

The limit of the roadstead is the arc of an imaginary circle with 10 a radius of 2,789 feet (850^m0) and the pier-head as centre.

A vessel should enter with plenty of way, on account of the strong tidal stream setting across the entrance, keeping the pier bearing 283°. The starboard anchor should be let go, in a depth of about 8 fathoms (14^m6), when the vessels is about 1½ cables from the pier and after 15 swinging, a hawser should be laid out to a post northward of the pier. *Chart 3241.*

Coast.—Anchorages.—There are a number of villages standing in the midst of coconut plantations on the east coast of Sanana. If there is insufficient room in Baai van Sanana, anchorage may be obtained by 20 vessels with local knowledge, in a small bight situated about one mile southward of Tandjung Bega (*Lat. 2° 18' S., Long. 126° 01' E.*), in a depth of 33 fathoms (60^m4), about 1½ cables from the coastal reef, or about 6 miles farther southward, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), but these anchorages are unsuitable during the strength 25 of the southerly monsoon.

Chart 942a.

OBI EILANDEN.—Anchorages.—These islands, which lie on the northern side of the Ceram sea, about 55 miles east-north-eastward of Sula eilanden, comprise Obi Major, 5,283 feet (1610^m3) high, and 30 seven smaller islands. The passages between these islands are deep in the fairway and clear of dangers, except that between Gomumu and the southern side of Obi Major and between Bisa and the northern side of Obi Major.

Anchorage may be obtained in most places, although usually in considerable depths, but from June to September the eastern and southern 35 coasts are difficult to approach owing to the high sea, and from December to February, inclusive, this applies to the western side. Vessels then usually proceed to the anchorage off Kampung Laiwui, situated off the northern side of Obi Major, between this island and Bisa. 40

Chart 2788.

Tapat and Bisa.—Tapat, the north-westernmost island of the group, and Bisa, which lies about 2½ miles eastward of it, are both wooded to the water's edge, being only broken by coconut plantations near the villages. The two highest peaks of Tapat, which have 45 elevations of 1,845 and 1,612 feet (562^m3 and 491^m4) are prominent. On Bisa there is a mountain ridge, 1,530 feet (466^m3) high at its north-western extremity.

Pulu Djerum (Jerum), lying on the wide drying reef which extends from the north-eastern extremity of Bisa, is a small group of muddy 50 patches covered with mangroves, in the middle of which there is a distinctive tree. Pulu Santaré, on the drying reef which extends about three-quarters of a mile from the south-eastern extremity of Bisa,

Charts 2759a, 1263.

Chart 2788.

although low, is visible from a considerable distance owing to the tall growth on it.

Off-lying danger.—Kurier, a reef with a depth of 6 feet (1^m8) over it, and steep-to, lies $7\frac{1}{2}$ miles east-north-eastward of Pulu Djerum; it consists of sand and coral, and is well marked by discoloration.

Bèlang Bèlang and Obi Latu.—**Anchorage.**—Bèlang Bèlang, situated $5\frac{1}{2}$ miles southward of Tapat, is a low island; its northern coast is sandy and steep-to; its southern coast and the coasts of Telor, an islet lying close off its south-western side, are muddy and covered with mangroves. There is a flagstaff on the north-eastern extremity of Bèlang Bèlang.

Anchorage may be obtained in a depth of 29 fathoms (53^m0), about $2\frac{1}{4}$ cables offshore, with the north-eastern and south-eastern points of Bèlang Bèlang bearing 340° and 232° , respectively; vessels approach this anchorage steering 324° with two high trees, near the north-eastern point, ahead.

A ridge, with a depth of 19 feet (5^m8) at its outer end, extends about one mile south-south-westward from the western extremity of Bèlang Bèlang, and a reef, with a depth of 7 feet (2^m1) over it, lies nearly 2 miles west-south-westward of the same point (*Lat.* $1^\circ 19' S.$, *Long.* $127^\circ 22' E.$).

Charts 2788, 3241.

Obi Latu, situated $2\frac{1}{2}$ miles southward of Bèlang Bèlang, has several prominent peaks, the highest of which, near the eastern end, has an elevation of 2,754 feet (839^m5), and appears as a sharp cone from south-westward. On the northern coast there are strong squalls from off the steep mountains, especially in the inlets, but farther out it is calmer.

A reef, with a depth of 8 feet (2^m4) over it, marked by discoloration, lies off Djiko Gusung Guku, and is situated about 2 miles south-westward of the north-western extremity of Obi Latu, and about one mile offshore. A small reef, marked by discoloration, lies close southward of Tusa, an islet situated off the north-eastern side of Obi Latu.

Anchorage may be obtained in the inlets on the northern side of Obi Latu; the rocky peninsulas between them and Tusa are bare and reddish in colour.

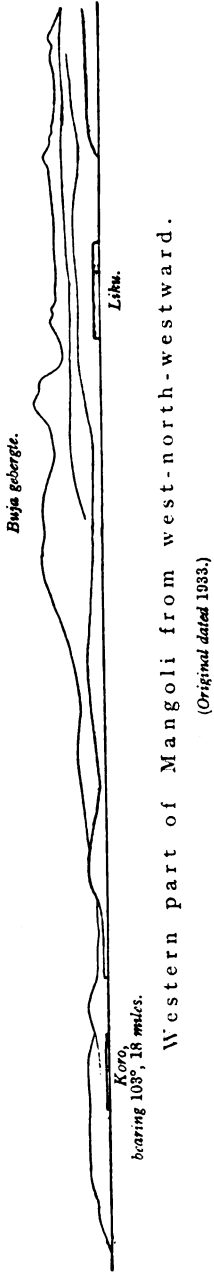
Chart 3241.

Western coast of Obi Major.—**Dangers.**—**Anchorage.**—Between Tandjung Leleo Basso, the north-western extremity of Obi Major and a position abreast Mala Mala, an island, 785 feet (239^m3) high, lying about half a mile offshore, about 5 miles southward, the coast is high. There is a deep passage between Mala Mala and Obi Major.

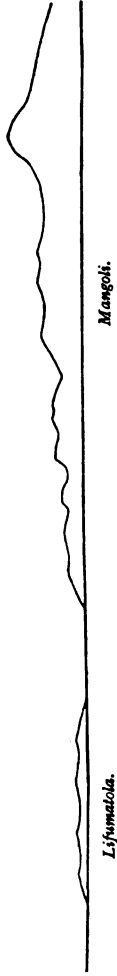
Pasi Turi is an islet fringed by a drying reef lying about $1\frac{1}{2}$ miles westward of the south-western extremity of Mala Mala. A reef, with a depth of 4 feet (1^m2) over it, lies $2\frac{1}{2}$ miles southward of the same point; it is only slightly marked by discoloration. A detached drying reef lies close off the western side of Obi Major, about 6 miles northward of Tandjung Ake lamo, the south-western point of Obi Major. A reef, with a depth of 4 feet (1^m2) over it, lies close offshore, about $5\frac{1}{2}$ miles northward of Tandjung Ake lamo; it is only slightly marked by discoloration.

At Tandjung Kawassi, situated about 3 miles north-north-westward

Charts 2759a, 1263.



Western part of Mangoli from west-north-westward.
(Original dated 1933.)

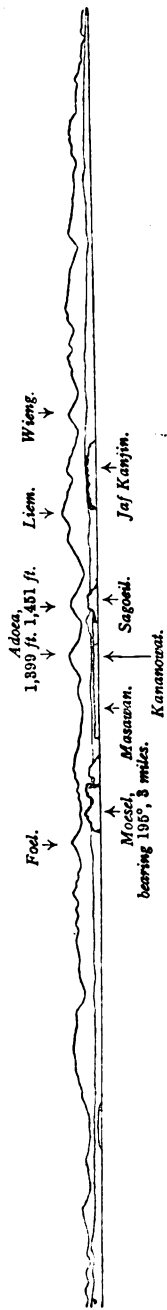


Eastern extremity of Lifumatola, bearing 180°, 28 miles.
(Original dated 1933.)

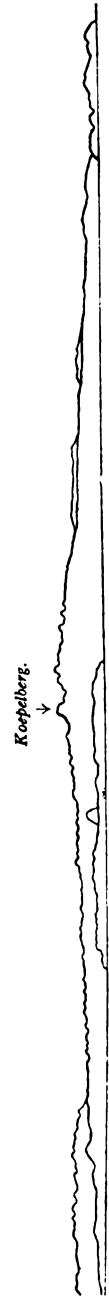


Obi eilanden from southward.
(Original dated 1933.)

Middle part of Kofiau from northward.
(Original dated 1933.)



Western part of Misool from northward.
(Original dated 1933.)



Moetika
bearing 304°, 8 miles.
East coast of Misool.
(Original dated 1933.)



El Kasja
bearing 247°, 6 miles.
Ef Kasja from east-north-eastward.
(Original dated 1933.)

Chart 3241.

of Tandjung Ake lamo and also about $1\frac{1}{2}$ miles northward of Tandjung Kawassi, there are coconut plantations and tall casuarina trees.

Anchorage may be obtained during the southerly monsoon northward of Tandjung Ake lamo, which is covered with mangroves. 5

Chart 2788.

Northern Coast of Obi Major.—The coast for about 4 miles eastward of Tandjung Leleo Basso is hilly, reddish in colour, and sparsely covered with vegetation. Kerka and Kadera, islets from about 100 to 130 feet (30^m5 to 39^m6) high, and densely covered with vegetation, lie 10 about 2 miles south-eastward, and 5 miles east-north-eastward, respectively, of Tandjung Leleo Basso, and are outstanding from a considerable distance. A detached reef in Djiko (Jiko) Dollong, entered about $3\frac{1}{4}$ miles south-eastward of the same point, is marked by discoloration, as is also the coastal reef extending from the eastern side 15 of this inlet. There is a 9-foot (2^m7) patch situated about half a mile northward, and a reef with a similar depth over it about three-quarters of a mile west-north-westward of Kerka.

From eastward of Kadera to Tandjung Anggai, situated about 13 miles east-north-eastward, the coast is low and covered with forest 20 and coconut plantations alternately. This part is mostly inhabited, but the villages are difficult to identify.

Within 10 miles of this stretch of coast there are a number of peaks, of which one, 4,319 feet (1316^m4) high, situated about $5\frac{1}{2}$ miles south-south-westward of Tandjung Anggai (*Lat.* $1^{\circ} 21' S.$, *Long.* $127^{\circ} 45' E.$), 25 is the easiest to identify. They are frequently already obscured by clouds one hour before sunrise, and often during the night. The peak 2,797 feet (852^m3) high, situated $6\frac{1}{2}$ miles south-westward of Tandjung Anggai, is conical, but does not show plainly against the land behind. The south-westernmost peak, 4,230 feet (1289^m3) high, which stands 30 about $10\frac{1}{2}$ miles south-eastward of Tandjung Leleo Basso, appears conical from northward, but from westward as a rounded crest.

Charts 2786, plan of Laiwui and adjacent channel, 2788.

Rede Laiwui and approaches.—**Dangers.**—**Anchorage.**—Rede Laiwui is situated in the channel between the northern side of Obi 35 Major and Bisa, off Kampung Laiwui, which lies about $12\frac{1}{4}$ miles north-eastward of Tandjung Leleo Basso. There is a pier at the village, with a depth of about 2 feet (0^m6) alongside.

The approaches to the roadstead are encumbered with reefs, some of which are only slightly marked by discoloration. Laiwui rif, which 40 dries, and on which there are two small bushes, lies about 3 miles west-south-westward of the pier at Kampung Laiwui. Sambiki is a small sandy islet covered with coconut trees, lying close off the northern coast of Obi Major, about $4\frac{1}{4}$ miles eastward of the pier.

There is no tidal stream in the roadstead. 45

A vessel approaching from eastward should keep Tandjung Bobane Huda, at the south-western end of Bisa, in line with the south-eastern extremity of the same island, bearing 276° , and pass the latter point at a distance of about $3\frac{1}{4}$ cables or less, thence she should steer westward until the zinc roofs and large sheds in Kampung Laiwui bear between 50 190° and 127° ; thence alter course southward and keep the head of the pier in line with the 3,325-foot (1013^m4) peak, situated about $5\frac{1}{2}$ miles south-south-eastward, bearing 165° , anchoring in a depth of about 11 fathoms (20^m1) when the northern extremity of Sambiki is

Charts 942a, 2759a, 1263.

Charts 2786, plan of Laiwui and adjacent channel, 2788.

in line with the first point eastward of Kampung Laiwui, bearing 091° , at a distance of about 2 cables from the edge of the coastal reef eastward of the pier; or with Pulu Kadera, bearing about 240° , open its own 5 width north-westward of Tandjung Tabuji, at a distance of about $1\frac{1}{2}$ cables from the coastal reef.

In approaching from westward, a vessel should keep in depths of over 100 fathoms (182^m9) until Laiwui pier bears between 127° and 190° when she should alter course southward and approach the 10 anchorage as directed above.

Chart 2788.

Coast.—Off-lying dangers.—Anchorages.—Between Laiwui and Tandjung Anggai the coast is bordered by coconut plantations, thence to Tandjung Woka, situated about 9 miles south-eastward, the 15 mountains approach close to the coast, chalk rocks appearing in places, and an occasional cocount plantation.

Two reefs which dry, on which lie the two Gêta eilandjes, which are sparsely covered with shrubs, and sand patches with casuarina trees, lie from about $2\frac{1}{2}$ to 3 miles offshore between Tandjung Anggai (*Lat.* 20 $1^{\circ} 21' S.$, *Long.* $127^{\circ} 45' E.$) and Tandjung Woka, and a shoal, with depths of from 11 feet to 6 fathoms (3^m4 to 11^m0) over it, lies within $1\frac{1}{2}$ miles north-westward of the north-western Gêta eilandje. Between these islets and the coast there is foul ground within $1\frac{1}{2}$ miles of Obi Major.

25 Pulu Woka, an island close north-westward of Tandjung Woka, shows well against the land behind on account of its light colour. The bight south-eastward of the island affords a calm anchorage for vessels with local knowledge at all times. There are coconut plantations and dwellings on the northern and southern sides of Pulu Woka.

30 *Chart 3241.*

Between a position about one mile northward of Tandjung Salam Burung, a rocky point situated about 3 miles south-eastward of Tandjung Woka, and Tandjung Parigi, which lies about 12 miles farther south-eastward, there is a barrier reef, within which there are a 35 number of islets and reefs lying from one to 2 miles offshore; these islets and the coast within them are covered with mangroves. Only at Pulu Kelo, an islet lying close offshore, $1\frac{1}{2}$ miles south-eastward of Tandjung Salam Burung, at the villages Sesèpè and Tawa, situated about 3 and 6 miles, respectively, farther south-eastward, and on the 40 eastern extremity of Marosa, an island on the barrier reef lying about $1\frac{1}{2}$ miles north-north-westward of Tandjung Parigi, are there sandy beaches with coconut trees. The villages are difficult to identify.

Good anchorage may be obtained by vessels with local knowledge anywhere off this stretch of coast inside the barrier reef, in moderate 45 depths, also off Sesèpè and Tawa and within Pulu Kelo, but here only the south-eastern entrance is available.

There is access to the area within the barrier reef north-eastward of Tandjung Salam Burung, also eastward of Pulu Kelo, north-eastward of Sesèpè, and north-westward of Pulu Marosa which lies about $1\frac{1}{2}$ miles 50 north-westward of Tandjung Parigi; the reef extending from Pulu Marosa is well marked by discoloration. The passage south-eastward of Pulu Marosa should not be attempted owing to the coral growth. Mud creeks extend some considerable distance inland westward of Tandjung Parigi. From this point to Tandjung Djobubu (Jobubu),

Charts 942a, 2759a, 1263.

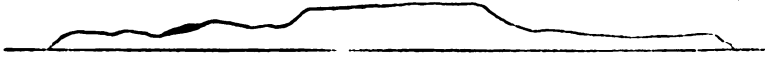
Chart 3241.

situated about 5 miles south-eastward, the coast is covered with high trees, and has no beach.

Charts 3241, 3242.

Straat Tobalai.—This strait, which separates the island of Tobalai 5 from the eastern extremity of Obi Major, is deep and clear of dangers. The coast of Obi Major is, like the low land within it, uniformly covered with vegetation, and in places is fringed by a narrow reef.

Tobalai has a flat tableland, 785 feet (239^m3) high, which slopes gradually on its south-western side; it is uninhabited. The dense 10



Tobalai, bearing 214°, 24 miles.

(Original dated 1888.)

forest reaches to the coast, which is rocky in many places. A useful landmark when approaching the strait is the steep slope on the eastern side of the summit, 2,681 feet (817^m2) high, which lies at the eastern end of a ridge of about the same height, which extends westward through the middle of Obi Major, about 11 miles westward of Tandjung Djobubu. 15

Chart 3241.

Southern coast of Obi Major.—Anchorage.—This coast is steep-to and the land within rises steeply; on it are a number of villages which can be distinguished by their coconut plantations; elsewhere the land to the top of the mountains is covered with forest. A peak, 20 3,164 feet (964^m4) high, which stands about 20 miles westward of Tandjung Djobubu (*Lat. 1° 37' S., Long. 128° 10' E.*), and a cleft in the coast southward of it are noticeable. The peaks in the middle of the island can also be identified, but they are frequently obscured by clouds. See view facing page 114. 25

The best anchorage off this coast in the favourable season of the year, is off Kampung Wai Lower, near the southern extremity of the island, as there is little or no tidal stream here.

Off-lying island and dangers.—Pasir Radja or Sophia reef, with a least depth of 26 feet (7^m9) over it, and seldom clearly marked by discoloration, lies about 5 miles south-westward of Kampung Wai Lower. 30

Pulu Gomumu, an island 914 feet (278^m6) high, lies about 5½ miles southward of Kampung Wai Lower. Except for Pasir Radja, there is a clear channel between the island and Obi Major. The island is fringed by a drying reef for the greater part. Kampung Pasir Putih 35 is situated on the north-eastern side of the island, and on the coastal reef here, which is marked by discoloration, is Pulu Paniki, an islet, close north-eastward of which there is a reef, with a depth of 3 feet (0^m9) over it. About half a mile northward of Pulu Paniki there is a drying rock, marked by discoloration. The deep passage between 40 Pulu Paniki and the reef should only be attempted when the reefs are plainly visible owing to the strong tidal stream.

Haga ma doto, an islet lying on the drying coastal reef on the south-eastern side of Pulu Gomumu, is difficult to identify from a distance.

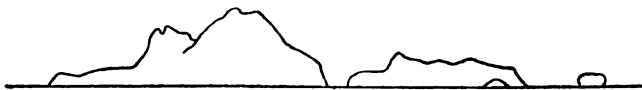
Charts 3242, 2788.

ISLANDS AND DANGERS BETWEEN OBI EILANDEN AND NEW GUINEA.—Lawin eilanden and Kekek.—Kekek or 45

Charts 942a, b, 2759a, 1263.

Charts 3242, 2788.

Silaijang, 690 feet (210^m3) high, densely wooded, and the shape of a truncated cone, lies 17 miles north-eastward of Tobalai.



Lawin eilanden, bearing between 130° and 142°.

(Original dated 1933.)



Kekek, bearing 152°, 14 miles.

(Original dated 1933.)

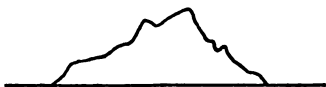
- 5 Toppershudje or Tema, 139 feet (42^m4) high, and rocky, covered with shrubs, lies about 2 miles north-eastward of Kekek.

- Watinger (*Lat. 1° 31' S., Long. 128° 42' E.*), 280 feet (85^m3) high at its north-eastern extremity, and wooded, lies 3½ miles eastward of Kekek. Lawin or Tapiola, situated about half a mile eastward of Watinger, is entirely occupied by a round hill, 772 feet (235^m3) high, with a notched appearance. A shoal, with a depth of about 8 fathoms (14^m6) over it, not marked by discoloration, lies nearly one mile northward of Lawin.

- 10 Laliola, which lies about three-quarters of a mile south-eastward of Lawin, is a flat island with high trees. A shoal, with a depth of 23 feet (7^m0) over it, extends about 7 cables south-eastward from Laliola.

- 15 The whole group is uninhabited. There is a well of fresh water in the middle of Watinger.

- Pisang.—Anchorage.—Pisang, an island situated about 12½ miles north-eastward of Lawin, is very steep and has two peaks, the higher of which has an elevation of 1,520 feet (463^m3). The depths in its vicinity are very irregular. The island is uninhabited, and is almost impenetrable owing to its steepness and dense growth. Good anchorage may be obtained by vessels with local knowledge close off the northern and south-eastern sides of the island.



Pisang, bearing 101°,
20 miles.



Pisang, bearing 180°,
34 miles.

(Originals dated 1933.)

- 25 Batu Anjur are two rocks above water, about one cable apart, with a depth of 3 fathoms (5^m5) between them, lying about 3 cables off the north-western side of Pisang. Another rock, above water, also named Batu Anjur, lies 4 cables off the south-eastern side of Pisang. A moderately strong stream may set between Pisang and this rock. *Chart 2788.*

- 30 Takat Sapa.—This reef, with a least depth of 29 feet (8^m8) over it and marked by discoloration, lies about 16 miles north-north-eastward of Pisang.

Charts 942a, b, 2759, 1263.

Chart 2788.

Boo eilanden.—Boo (Bo) eilanden, which lie about 25 miles north-eastward of Pisang, consist of three islands and several islets. The islands are uninhabited and fresh water is practically unobtainable. The two western islands, named Boo Besar, are about 328 feet (100^m0) 5 high and flat, and are separated from one another by a narrow passage filled with a reef. On the northern side of the islands there are rocky parts interspersed with sandy beaches and forest; the southern coast is mostly covered with mangroves. The shoals extending about three-quarters of a mile off the western extremity are usually marked by 10 discoloration.

Boo Ketjil or Popa, the eastern island, and the islets between it and Boo Besar, are low; these islets are mostly of atoll formation, and the coral edge is thickly covered with vegetation. The lagoons are shallow and are only accessible to praus. 15

A ridge of reefs, consisting of sand and coral, and marked by discoloration, lies along almost the entire southern edge of the bank on which this group lies, at a distance of about one mile. Between this ridge and the southern edge of the group there is a channel, which, except off the southern side of Boo Ketjil, is clear of dangers. There 20 are several passages through the ridge of reefs, that southward of Jef (Yef) Beto (*Lat. 1° 12' S., Long. 129° 24' E.*), an islet lying about half a mile south-eastward of the south extremity of Boo Besar, being the best. The water is usually very clear during the transition periods of the monsoons, when the bottom can be seen up to depths of about 25 9 fathoms (16^m5). There are several channels between the islets, available for vessels with local knowledge.

Vessels should not approach the southern side of the group within 3 miles.

A basin lies off the western side of Boo Ketjil, the eastern part is 30 deep and clear but the western part is full of dangers, there are good approaches from north-eastward and northward, on either side of Taudore, an island situated about three-quarters of a mile northward of Boo Ketjil.

Dona Carmalita, a shoal, which lies about 6 miles southward of Boo 35 Ketjil, has a least depth of 19 feet (5^m8) over it; the atoll edge is marked by discoloration, and the presence of fish. A deceptive appearance of rocks above water is sometimes produced by large schools of porpoises lying on the surface. The tidal streams which set northward and southward at a rate of about 2 knots, when opposed to 40 the wind, cause breakers on the shoal. A maximum rate of 2½ knots has been observed amongst the islands.

Chart 3744.

Kofiau.—**Anchorages.**—The islands of Kofiau, Salawati, Bantata and Waigeo form together the Radja Ampat eilanden. Kofiau, 45 situated about 15 miles eastward of Boo Ketjil, has two prominent hills on its northern side; Mata or Boemfoar, the western hill, is 943 feet



Mata, bearing 248°.

(Original dated 1933.)

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

(287^m4) high, and the other 657 feet (200^m2). Both hills are dome-shaped when seen from northward or southward, but are conical from eastward. Elsewhere, except for some hills in the western part, the island is low. See view facing page 115.

Kofiau is thickly covered with vegetation, as are also the islets lying along its northern coast and those off its south-western side. The eastern end of the island is totally uninhabited; mangrove swamps lie close behind the beaches. Except in the inner bays on the southern side, the water is so clear that the bottom can be seen in a depth of about 10 fathoms (18^m3).

The western and southern sides of the islands off the south-western coast of Kofiau, and also the northern, eastern, and southern coasts of Kofiau itself as far westward as Tandjoeng Ai Tapor can be safely approached to a distance of half a mile.

During November and December strong tidal streams, attaining a maximum rate of 2½ knots, set along the coast of Kofiau and between the islands.

Charts 3744, 3745.

Good anchorage may be obtained by vessels with local knowledge, in depths of from 8 to 14 fathoms (14^m6 to 25^m6), during the northerly monsoon, in the channel between Kofiau and Ef Torobi, an island lying close westward. There is a 33-foot (10^m1) patch in the northern entrance of the channel, which can be avoided by keeping on the Ef Torobi side near the middle. Djailolo, an islet, lies on the eastern side of the entrance, and close eastward of it are three other islets; Mangi Mangi, the westernmost, is connected to Djailolo by a reef. A vessel can approach the anchorage by passing between these islets and the coast of Kofiau, in a least depth of 10 fathoms (18^m3).

An excellent anchorage may be obtained by vessels with local knowledge, in depths of from 6 to 10 fathoms (11^m0 to 18^m3), in the channel between the northern side of Kofiau and Deer, an islet situated northward of Mata (*Lat.* 1° 10' S., *Long.* 129° 50' E.). The channel is about 1½ cables wide at the anchorage southward of Kampoeng Deer, situated on the southern side of the islet of that name. The western entrance to the channel is narrowed by the coastal reef. A vessel lies here quietly in all conditions of weather.

Chart 3744.

Wambong or Suriname baai, which lies on the southern side of Kofiau at its eastern end, is narrow, but affords good shelter from all winds, except south-westerly, which seldom occur. The anchorage is, however, narrow. The western shore is covered with mangroves, and the eastern shore is fringed by a narrow coral reef with mangroves inside it, with a sandy beach at the inner end.

Good anchorages may be obtained by vessels with local knowledge amongst the islets off the south-western side of Kofiau.

The few Papuan inhabitants live in scattered settlements on the western islets, on the eastern end of Ef Torobi and Deer. Fish abound in the vicinity.

It is not advisable to anchor close to low mangrove shores, as these areas, especially in the southern parts, abound in small flies whose bite causes severe irritation usually lasting about three days.

MISOOL.—This island is situated with Tandjoeng Jamtoe, its

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

northern extremity, about 38 miles south-westward of Tandjoeng Sele, the western extremity of New Guinea; it is low in its northern part, and high in the southern part. The islets lying off the northern side of the island are low, and those off the eastern and south-eastern sides are high. 5

Northern side of Misool.—Dangers.—There are numerous islets and dangers off the northern coast of Misool, for which the chart must be consulted. The outer danger off the western end is Fitzmaurice shoal or Masmas Oelit, with a depth of 3 fathoms (5^m5) over it, seldom 10 marked by discoloration, lying 13 miles northward of Tandjoeng Fet Dom, the western extremity. The peaks on the south-western coast are only visible from northward when off Waigama, and from farther eastward when farther offshore. See view facing page 115.

Waigama.—Dangers.—Kampoeng Waigama, on the northern 15 coast of Misool, situated about 7 miles east-north-eastward of Tandjoeng Fet Dom, is the only village of any importance in the island; it is the headquarters of a Government official and of the Rajah of Noord Misool.

A 23-foot (7^m0) patch lies about 8 cables north-north-westward of 20 Waigama and a 15-foot (4^m6) patch about 9 cables north-north-eastward. Pial, an islet, lies on the coastal reef about 6 cables west-north-westward of Waigama, and Katapoe lies on the southern edge of a detached reef situated about 1½ miles east-north-eastward of Waigama. 25

Anchorage.—Directions.—The best anchorage is in a depth of about 10 fathoms (18^m3), with the northern extremity of Pial in line with the northern extremity of Kaptjan Ketjil, an islet lying close offshore about 3½ miles west-south-westward, bearing 252°, and 30 Wagajel, a small peninsula close eastward of the village, 180°.

A vessel approaching from westward should pass between Tandjoeng Fet Dom (*Lat.* 1° 53' S., *Long.* 129° 43' E.) and Kanari, an island situated about 4½ miles north-westward, and thence about 2½ cables northward of Pial; or she may pass more than one mile northward of Pial and approach the anchorage with the western extremities of 35 Pian and Moeslat, islets situated about 5 and 7 miles, respectively, northward of Waigama, bearing 002°, astern, which will lead between the 15-foot and 23-foot (4^m6 and 7^m3) patches mentioned above.

A vessel approaching from northward should keep the eastern peak of the mountain Adeoa, 1,399 feet (426^m4) high, in line with the 40 western side of Jef Kanjin, bearing 198°, then pass westward of Jef Kanjin and proceed as given below.

A vessel approaching from eastward should pass between Tandjoeng Jamtoe and Kalies eilanden, thence steer to pass one mile northward of the small detached reef situated about 2 miles north-north-eastward of 45 Tandjoeng Haokep, which lies about 13½ miles westward of Tandjoeng Jamtoe; this reef can be identified by its being abreast a low white sand hill. When this reef bears 180° the vessels should steer to pass southward of Laitot and Haowat, islets lying about 3 miles west-north-westward of Tandjoeng Haokep, thence pass between Bellis 50 Darat and Moet Mafela, situated about 3½ miles farther westward, thence keep the north-western extremity of Moet Mafela in line astern with the south-eastern extremity of Haitlal, bearing 068°, until the inconspicuous rocky point situated westward of Sungei

Charts 3242, 942b, 2759a, 1263;

Chart 3744.

Bano, about $1\frac{1}{4}$ miles eastward of the small peninsula Wagajel, is in line with Liem, 1,592 feet (485^m2) high, which stands on the south-western side of the island, bearing about 195° . Thence she should
 5 steer for Liem, which is distinctive, bearing 192° , until the northern extremity of Pial is in line with the northern extremity of Kaptjan Ketjil, bearing 252° , when she should steer on this line, which leads between the reef extending from the northern side of Katapoe and the 15-foot (4^m6) patch north-westward of it, and thence to the anchorage.

10 **Tidal streams.**—Off Waigama, the tidal stream sets westward with the rising tide, at a maximum rate of 2 knots in the open, and 3 knots in the narrow passages.

Eastern side of Misool.—Between Tandjoeng Jamtoe and Tandjoeng Openta, situated about 12 miles south-south-eastward, where
 15 the coast is low and flat, the most prominent marks are Zadelberg 1,071 feet (326^m4) high, and Koepelberg, 964 feet (293^m8) high. Southward of Tandjoeng Openta, the coast rises vertically from the sea. Baai van Tamoelol, situated southward of Tandjoeng Openta, is inaccessible, as it is encumbered with numerous reefs, which are
 20 steep-to. The only inhabited place is Kampoeng Tamoelol at the head of the bay. Bajampop, 798 feet (243^m6) high, situated on the southern side of Mesemta, about 9 miles southward of Tandjoeng Openta, is cone shaped and distinctive. See view facing page 115.

Off-lying islands and dangers.—**Anchorage.**—Amongst the
 25 islands which extend east-south-eastward from Mesemta there are many deep channels, but they are not recommended on account of the strong and irregular currents, and the very slight discoloration of the reefs; there is a safe passage, however, between Ef Pian, a group of islets which lie about 17 miles east-south-eastward of Mesemta, and the
 30 Sagof group, situated about 2 miles westward.

Ef Kasja or Seven islands, situated about 4 miles north-north-eastward of Ef Pian, are steep-to, the highest having an elevation of 172 feet (52^m4). See view facing page 115.

Valsche Pisangs are the easternmost of the chain of islands and
 35 scattered rocks lying off the south-eastern end of Misool. The principal island of this uninhabited group is Daram (*Lat.* $2^\circ 09' S.$, *Long.* $130^\circ 55' E.$), 431 feet (131^m4) high, and covered with forest. An islet, 286 feet (87^m2) high, which is connected to the southern side of the eastern extremity of Daram by a drying reef, is also wooded, and when
 40 seen from southward is striking on account of some steep yellow rocks. A detached rock, in the shape of a beehive, lies on the coastal reef off the eastern extremity of Daram. The passage immediately northward of Daram is clear of dangers.

The remaining islets of the group consist of high masses of rock; the
 45 north-westernmost are some black rocks, 14 feet (4^m3) high, lying $6\frac{1}{4}$ miles north-westward of the western extremity of Daram. The rocks lying about three-quarters of a mile east-south-eastward of the black rocks, are only just above water.

Anchorage may be obtained during the South-east monsoon, off the
 50 northern side of Daram.

A 10-foot (3^m0) patch lies about $3\frac{1}{4}$ miles south-eastward of the black rocks. A shoal, with a depth of 11 feet (3^m4) over it and another with a depth of 10 feet (3^m0) over it, lie about $2\frac{1}{4}$ miles westward and $1\frac{1}{4}$ miles south-eastward, respectively, of the western extremity of Daram.

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

Southern side of Misool.—Anchorage.—Between Tandjoeng Motlol, situated about $1\frac{1}{2}$ miles south-eastward of Tandjoeng Fet Dom, and the islands off the south-eastern coast, there are several peaks which are good landmarks and the coast is clear of dangers for a distance of 20 miles east-south-eastward of Tandjoeng Motlol. To a vessel approaching the western end of Misool from westward, only Liem (page 122), which appears as a cone, will be seen. Approaching nearer, Elban and Jadata, which stand about 12 and 14 miles farther eastward, will be identified.

The passage between Poeloe Tiga, situated about 19 miles east-south-eastward of Tandjoeng Motlol, and the southern side of Misool is safe, but the coastal reef is not well marked by discoloration.

Anchorage may be obtained by small vessels with local knowledge between Joe, an islet situated 2 miles eastward of Poeloe Tiga, and the coast of Misool. The ridge with a drying rock on it, which extends from the eastern extremity of Joe, is nearly always marked by surf. The natives state that during the South-east monsoon this part of the coast is almost inaccessible. Between Jef Bie, an islet situated about $5\frac{1}{2}$ miles east-south-eastward of Joe, and the coast of Misool the coastal reef is not marked by discoloration, except in the channels, one on either side of Kaheri, which, unlike the channel on the western side of Jef Bie, are easy to navigate.

Baai van Lilinta and approaches.—Dangers.—Anchorage.—This bay, entered between Tandjoeng Wafani, situated about 6 miles eastward of Jef Bie, and Tandjoeng Kapat Malesket, the prominent headland forming the western extremity of Langkissiel, an island which lies 6 miles farther eastward, is encumbered with dangers. It is sheltered during the North-west monsoon but is difficult to approach during the South-east monsoon, on account of the high seas. Lilinta, the principal village, lies close north-eastward of Tandjoeng Wafani.

The bay can be approached from westward without difficulty, but the reefs are not well marked by discoloration, except around Fagom genan, situated 3 miles south-south-westward of Tandjoeng Wafani (*Lat. $2^{\circ} 03' S.$, Long. $120^{\circ} 16' E.$*).

On approaching the anchorage off Lilinta, Ketjitot, an islet situated about 2 miles eastward of Tandjoeng Wafani, in line with Tapalol, bearing 052° , leads south-eastward of the reef, which is only slightly marked by discoloration, extending from Tandjoeng Wafani, and the 3-fathom (5^m5) patch off it, which is not discoloured. The anchorage is calm during the North-west monsoon.

Approaching from southward the best channel is eastward of Jef Pelee, an island situated about $7\frac{1}{2}$ miles southward of Tandjoeng Wafani, thence eastward of Kaoenoet Sollon, a rock, 202 feet (61^m6) high, which stands about $2\frac{1}{2}$ miles north-eastward of the eastern extremity of Jef Pelee, thence between Batoe and Maté, situated about $2\frac{3}{4}$ miles farther north-eastward. There is, however, a 23-foot (7^m0) patch, slightly marked by discoloration, on the western side of this passage, and a rock close off the western extremity of Maté. A vessel should pass about 2 cables westward of this rock, which will lead through in a least depth of 6 fathoms (11^m0), and thence steer for the entrance to Baai van Lilinta, avoiding a shoal, with a depth of 26 feet (7^m9) over it, which lies about 3 miles south-eastward of Tandjoeng Wafani.

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

The easiest approach from eastward is northward of Boo, an island, 464 feet (141^m4) high, which rises vertically from the sea, situated 17 miles eastward of Jef Pelee, thence northward of the chain of islands 5 of which Boo is the easternmost. Batbitiem, southward of this chain, has a distinctive summit, 565 feet (172^m2) high, which appears very sharp from north-north-eastward. Thence the route given above for the southern approach should be followed.

On the northern side of this approach are:—Djal eilanden, 126 feet 10 (38^m4) high, which lie about 7 miles northward of Boo, and a conspicuous rock about one mile west-north-westward of them; Djam eilanden, situated about 2½ miles west-south-westward of Djal eilanden, are low; the drying reef which lies about one mile north-westward of them is marked by discoloration, and has two rocks on it which just 15 show above high water. Balbiléget, some rocks 182 feet (55^m5) high, which stand about 3½ miles north-westward of Djam eilanden, are conspicuous.

The passage between Wajaban, an island which lies about 8 miles north-westward of Boo, and Olobie palé, a conical islet situated about 20 one mile south-eastward of it, may be used, but there is a 16-foot (4^m9) patch, well marked by discoloration, in the middle.

There is another approach from eastward farther northward between Jaganan and Gag, islets lying about 3 miles eastward of Tandjoeng Kapat Malesket. The reefs extending from these islets, except that 25 from the south-western end of Jaganan, are well marked by discoloration. The reefs extending from Jilloe, an islet situated about half a mile south-south-westward of Gag, and from Tandjoeng Dabatan, the western extremity of Ketimkerio, which lies about 1½ miles south-south-westward of Jilloe, are also well marked by discoloration. 30 The channels between Jaganan and Japale, which lies north-westward of it, between Japale and the coast of Misool, and between Gag and Ginjamato, situated south-eastward of it, should not be used, on account of their bends and the strong tidal streams in them.

35 **Kampoeng Lilinta** (*Lat. 2° 03' S., Long. 130° 16' E.*), only a few houses of which are visible from seaward, is the headquarters of the Rajah of Zuid Misool. The zinc roof of a storehouse shows up well. Kampoeng Fafanlap stands on the northern shore of Baai van Lilinta, about 6 miles north-eastward of Kampoeng Lilinta.

40 **Tidal streams.**—The tidal streams off the southern coast of Misool set eastward and westward at a maximum rate of 2 knots, which is generally less than that off the northern coast. In the narrow channels, however, the streams are sometimes stronger and very irregular.

Chart 3241.

45 **BURU.**—Buru lies on the southern side of Ceram sea, with Tandjung Palpetu, its north-western extremity, 38 miles southward of Sanana (page 111). It is very mountainous, but the peaks are difficult to identify at a distance, the higher ones being frequently obscured by clouds. At the eastern end of the island is Vlake van Namlea, an 50 extensive plain, which extends to the eastern coast. The island is fringed by a reef in many places, but there are depths of over 100 fathoms (182^m9) close to the coast nearly everywhere.

Climate.—The climate is reported to be unhealthy.

Charts 942a, 2759a, 1263.

*Chart 3241.***NORTHERN SIDE OF BURU. — Coast. — Anchorages.**—

Between Tandjung Palpetu, which is a distinctive sloping point, and Tandjung Bebek, situated about 12 miles eastward, the mountains approach close to the coast at Bara baai. This mountain ridge has some remarkable peaks, the highest of which, and of the whole island, is Kapalatmada, with a fairly sharp peak, 7,967 feet (2428^m3) high, which stands about 10 miles south-south-westward of Tandjung Bebek. Tomahu, situated about 9 miles farther westward, has a double peak, the eastern of which is 7,088 feet (2160^m4) high, and appears as a sharp horn with the point inclined westward. At the western end of the ridge, about one mile from the western coast, is a sharp cone, covered with vegetation, 2,397 feet (730^m6) high. From Tomahu, a desolate high ridge, with three salient peaks on it, slopes down to Tandjung Palpetu, and from a position situated about 5 miles eastward of Kapalatmada, a spur with two triple peaks extends northward towards Tandjung Bebek.

There are a number of villages on the northern coast of Buru, the positions of which may best be seen on the chart. There is no good anchorage off the coastal villages; except in Bara baai the sea bottom rises so steeply to the shore almost everywhere that no good anchorage can be found even in the southerly monsoon. Bara baai is entered between Tandjung Palpetu and Tandjung Bara, about 8 miles eastward. There is a narrow plain at the head of the bay. Kampung Bara is situated close southward of Tandjung Bara.

Drinking water can be obtained from the various rivulets which flow into the bay.

The tidal streams set eastward and westward along the northern coast of Buru at a maximum rate of about 2½ knots. The west-going stream is inclined to set into Bara baai.

Between Tandjung Bebek and Tandjung Wamlana, situated 13 miles eastward, the coast consists of an unbroken sandy beach, behind which the plain rises to hilly land covered with reeds, and thence farther inland to a continuation of the mountain ridge described above. On the eastern part of this ridge, situated about 9 miles southward of Tandjung Ili, about midway between Tandjung Bebek and Tandjung Wamlana, there is a peak, 4,781 feet (1457^m3) high, which appears as a square block from north-eastward and northward; from farther westward it appears as the summit of a ridge.

Between Tandjung Wamlana and Tandjung Wapoti, situated 10 miles eastward, and about 1½ miles farther eastward to Tandjung Batu Nuhan, the coast still consists of an unbroken sandy beach. The only river is the Wai Nibé, which is about 100 feet (30^m5) wide at its mouth, flowing into the sea at Tandjung Wambé, situated about midway between Tandjung Wamlana and Tandjung Wapoti (*Lat.* 3° 45' 04" S., *Long.* 126° 41' E.). The peak, 2,987 feet (910^m4) high, which stands on the eastern side of the Wai Nibé, about 4 miles inland, can be identified by its very dark colour.

The aspect of the coast between Tandjung Wapoti and Tandjung Hatawanu, situated about 6 miles eastward, is in striking contrast to that on either side of it, for it is high, steep, and rocky, and the mountains come closer to the coast. The highest part, with an elevation of 2,035 feet (620^m3), is the extremity of a ridge of nearly equal height running north and south, southward of Tandjung Batu Nuhan.

Charts 942a, 2759a, 1263.

Chart 3241.

Eastward of this ridge, which has a very steep eastern side, and separated from it by a deep cleft, is a high plateau.

Between Tandjung Hatawanu and the entrance to Wa Eplau baai, 5 which lies about 7 miles south-eastward, the coast consists of an unbroken sandy beach, behind which there is a plain which rises gradually within to light green hills, covered with long grass, which connect with the mountains in the interior.

There is a commanding hill, 637 feet (194^m2) high, with a tree on it, 10 situated about 4 miles north-westward of Tandjung Karbau, and Terwissie, 1,165 feet (355^m1) high and devoid of trees, stands about 2½ miles farther north-westward. All the other hills in this vicinity are sparsely covered with trees.

Although good anchorage may be obtained, out of the influence of the 15 tidal streams, by vessels with local knowledge, in Wa Eplau baai and Djiku (Jiku) Merasa, situated about 8 miles south-eastward, they are both unsafe during the South-east monsoon.

Chart 911, plan of Kayeli bay.

Baai van Kajeli.—Anchorage.—Baai van Kajeli (Kayeli), on the 20 north-eastern side of Buru, is entered between Tandjung Karbau, situated 8½ miles south-eastward of Djiku Merasa, and Tandjung Waät, a low point, which lies about 4½ miles farther south-eastward; these points rise to hilly land and are easy to identify, as the land round the head of the bay is low and muddy.

25 Good anchorage may be obtained by small craft with local knowledge in a bight in the coastal reef on the southern side of the bay, in depths of from 19 to 22 fathoms (34^m7 to 40^m2), mud and sand. The drying reef which extends about three-quarters of a mile westward from Tandjung Pasir Putih, situated about 2 miles south-westward of 30 Tandjung Waät, should be given a good berth when it is covered, as it is not marked by discoloration. The islets Besar and Ketjil lie on this reef. There is a deep channel in the reef eastward of Ketjil, accessible to small craft with local knowledge.

Wai Apu flows into the western side of the bay at Tandjung Wa Apu. 35 In 1928, it was ascended by a motor boat for a period of 5 hours, in a least depth of 10 feet (3^m0); the width of the river varied from about 90 to 110 yards (82^m3 to 100^m6), and the rate of the stream was estimated to be from 3 to 4 knots.

Rainfall.—See page 27.40 *Chart 911, plan of Namlea road.*

Rede Namlea.—Light.—Beacons.—Rede Namlea lies on the northern side of Baai van Kajeli, its limits being the meridian of 127° 05' 10" E. and the parallels of 3° 16' 20" S. and 3° 16' 30" S. The roadstead is always free from swell.

45 A light (*Lat.* 3° 17' S., *Long.* 127° 06' E.) is occasionally exhibited from an iron mast, 16 feet (4^m9) in height, which stands on the head of the pier, where there is a depth of 6½ feet (2^m0).

A pile beacon marks the eastern end of a shoal situated about 8½ cables west-south-westward of the pier. The roadstead is much 50 encumbered with shoals, some of which are marked by beacons; their positions can best be seen on the plan.

A mosque situated about 1½ cables north-westward of the pier is a prominent mark.

Anchorage.—Directions.—Anchorage may be obtained, in a depth

Charts 942a, 2759a, 1263.

Chart 911, plan of Namlea road

of about 11 fathoms (20^m1), about half a mile west-south-westward of the pier-head, also on the northern side of a 2½-fathom (4^m6) patch, which lies about 4½ cables westward of the light structure, and on the south-eastern side of a 1½-fathom (3^m2) patch, situated about 4 cables south-westward of the light structure. 5

A vessel approaching Rede Namlea should not pass too close to the northern entrance point of Baai van Kajeli on account of two one-fathom (1^m8) patches which lie close southward of it. A clump of high trees stands on the slope of the hill close westward of these patches, 10 and on a clear night these trees are sufficiently visible for a vessel to enter until the light on the pier at Namlea is sighted.

Chart 3241.

WESTERN SIDE OF BURU.—Coast.—Between Tandjung Waeken, situated about 4 miles south-westward of Tandjung Palpetu 15 (page 125), and Tandjung Wafia, about 2½ miles farther south-westward, there are three prominent hills, lying close inland, the northernmost of which is 840 feet (256^m0) high and half bare, and the middle one entirely bare. Tandjung Wafia is low and covered with coconut trees. About 2½ miles farther southward the coast is very high and 20 the mountains approach close to the sea. Tomahu (page 125) is very prominent and appears as a cone from westward.

Tomahu eilanden, consisting of Tomahu about 1½ miles southward of Tandjung Wafia, and Tengah, about 4 cables farther southward, lie close offshore. About 2 miles southward of Tengah is Fogi, a hilly 25 island, which is a good landmark. Southward of this island the rocky coast changes to a sandy beach.

Anchorage.—Anchorage may be obtained by vessels with local knowledge, in smooth water, in the channel between Tomahu eilanden and the coast of Buru, in depths of from 13 to 21 fathoms (23^m8 to 38^m4), mud and sand. There is a 10-foot (3^m0) patch, occasionally marked by discoloration, in the middle of the fairway situated about 1½ miles from the southern extremity of Tengah, a 30-foot (9^m1) patch near the middle of the fairway about 4 cables eastward of the same point, and there are several sunken rocks in the southern approach. 35 Vessels should enter the channel either between Tomahu and Tengah, or southward of Tengah; for larger vessels the passage between Tengah and Tomahu, in which the drying reefs show distinctly, is preferable.

Kampung Pulu Tengah (*Lat.* 3° 13' S., *Long.* 126° 00' E.) is situated at the northern end of Tengah. There is a small steep sandy 40 beach here, off which a vessel may anchor, in a depth of 16 fathoms (29^m3).

Anchorage may also be obtained by small vessels with local knowledge, when the reefs are plainly visible, off Kampung Fogi, situated about 2½ miles southward of Pulu Fogi. 45

Tidal streams.—The tidal streams inside Tomahu eilanden are weak; in the northern entrance to the channel between Tomahu and the coast, between Tomahu and Tengah, and between the reefs southward of Tengah, a vessel approaching from outside is soon clear of the stream, which sets across the entrances. 50

The tidal streams off this coast set northward and southward at a moderate rate, and during the southerly monsoon there is a considerable sea and swell from southward.

Charis 942a, 2759a, 1263.

Chart 3241.

Coast.—Anchorage.—At Tandjung Sarmana, situated about 7½ miles south-south-eastward of Pulu Fogi, and at Tandjung Walimen, about 5 miles farther south-eastward, the land, thickly covered with
5 vegetation, rises close within the beach. Tandjung Walwawat, situated 11 miles south-eastward of Tandjung Walimen, is the southern extremity of a wide strip of low land, through which Wai Kuma flows into the sea, the muddy waters of which extend for many miles offshore. Approaching from north-westward or south-eastward, a long row of
10 isolated trees will be sighted on this point. The only anchorage, free from swell during the southerly monsoon off this stretch of coast, is close off the coconut plantation of Kampung Wamsasi, situated about 5 miles north-north-westward of Tandjung Walwawat.

SOUTHERN SIDE OF BURU.—Anchorage.—Between Tand-
15 jung Walwawat and the entrance to Leksula baai, which lies about 21 miles south-eastward, the most noticeable feature is Vlakte van Mala, a plain extending some distance inland. Wai Mala flows out at Tandjung Wamala, a low point situated 10½ miles south-eastward of Tandjung Walwawat, and its muddy water extends some miles
20 offshore. On either side of Vlakte van Mala the hills approach the coast, which is rocky in places. Tandjung Atju, situated about 2½ miles south-eastward of Tandjung Wamala, is distinctive from north-westward. Sanane, a hill, 968 feet (295^m0) high, which stands close within Tandjung Atju, and on the western side of the entrance to Tifu
25 baai, is a good mark on account of its isolated position.

Anchorage may be obtained over a sandy bottom anywhere off this stretch of coast, under favourable conditions.

Off-lying dangers.—A detached reef, with a least depth of 26 feet (7^m9) over it, lies about 1½ miles south-south-westward of Tandjung
30 Fatufat, situated about 5½ miles east-south-eastward of Tandjung Walwawat. A detached reef, with a depth of 39 feet (11^m9) over it, lies about 2 miles westward of Tandjung Wamala.

Tifu baai.—Anchorage.—Tifu baai, entered about half a mile eastward of Tandjung Atju, is free from swell and tidal stream, but the
35 anchorage is very confined. During the southerly monsoon it is not always possible to enter the bay on account of its narrow entrance and the tidal stream which sets across the entrance. During this monsoon it is advisable to enter in the early morning if possible as the wind increases in the course of the day. *See view facing page 132.*

40 A flag is displayed at the flagstaff on the eastern entrance point when it is inadvisable to enter, and a red flag is displayed when there is already a vessel in the bay.

Pulu Ketjil (*Lat.* 3° 42' S., *Long.* 126° 24' E.) lies on the northern side at the eastern end of the bay. Kampung Tifu, with a pier, lies
45 on the southern side.

A vessel should approach the entrance at reduced speed and enter with only sufficient speed for steerage way. When Pulu Ketjil bears 060° she should steer for it on that bearing, and let go the starboard anchor when the point on the north-western shore, situated about 3½
50 cables westward of the head of the pier, bears not less than 270°, or when the pier-head bears about 094°, veering about 27 fathoms (49^m4) of cable, and after swinging she should lay out a hawser to a tree on Pulu Ketjil.

Charts 942a, 2759a, 1263.

Chart 3241.

Coast.—Dangers.—A shoal, with a depth of 13 feet (4^m0) over it, lies about $3\frac{1}{2}$ cables offshore, $3\frac{1}{2}$ miles south-eastward of Tandjung Atju. About 2 miles farther south-eastward and about half a mile offshore there is a drying reef, marked by discoloration. 5

Leksula baai.—Danger.—Light.—This bay, entered between Tandjung Kabat Roit, situated about $8\frac{1}{2}$ miles south-eastward of Tandjung Atju, and Tandjung Kabat Ha, which lies about 7 cables farther south-eastward, is backed by high land. The entrance points, which are also high, are excellent marks for making the entrance. 10
Méfa, 1,851 feet (564^m2) high, stands about $2\frac{1}{2}$ miles north-westward of Tandjung Kabat Roit, and Miten and Tef Dula, situated about 3 miles north-north-eastward and 6 miles eastward, respectively, of the same point, are easily identified against the higher mountains farther inland. 15

A reef, on which there are some rocks above water, and with a depth of 10 feet (3^m0) at its outer end, extends about $3\frac{1}{2}$ cables east-south-eastward from Tandjung Kabat Roit; a reef, on which there is an islet on its outer end, extends about one cable northward from Tandjung Kabat Ha. (*Lat. $3^\circ 48' S.$, Long. $126^\circ 31' E.$*). 20

Midden eilandje, which is steep-to on its seaward side, is a high islet lying about 4 cables eastward of Tandjung Kabat Roit, and about 2 cables east-south-eastward of the islet there is a reef, which dries.

A light is occasionally exhibited, at an elevation of 18 feet (5^m5), from a white iron framework structure, 13 feet (4^m0) in height, at the head of the bay, about a quarter of a mile south-eastward of Kampung Leksula, which is approached through an opening in the drying shore reef. 25

There is a landing pier with a depth of $6\frac{1}{2}$ feet (2^m0) alongside, on the north-western side of the bay. 30

The limit of the roadstead is the arc of an imaginary circle with a radius of 4,265 feet (1300^m0) and the light as centre.

Anchorage.—Directions.—Anchorage may be obtained in the middle of Leksula baai, in a depth of about 19 fathoms (34^m7), mud. During the strength of the South-east monsoon a vessel may anchor 35 a little farther eastward, in a depth of 11 fathoms (20^m1), and during the North-west monsoon slightly farther north-westward, in a depth of 15 fathoms (27^m4).

Batu Kapal, situated about $2\frac{1}{2}$ miles east-south-eastward of Tandjung Kabat Ha, lies on the southern end of a reef which extends about $1\frac{1}{2}$ 40 miles west-south-westward from the coast from a position about $3\frac{1}{2}$ miles eastward of Tandjung Kabat Ha, and is a good mark for making the entrance. When the bay is well open, a vessel should steer for Midden eilandje, bearing about 022° until the light structure bears 038° , when she should steer for the latter on that bearing, which leads 45 between Midden eilandje and the discoloured drying reef east-south-eastward of it.

Outlying shoals.—A shoal, the position of which is approximate, was reported, in 1950, to lie about 18 miles south-westward of the light-structure at the head of Leksula baai. 50

Charts 3239, 942a.

A shoal, the position of which is doubtful, was reported, in 1927, to lie about 35 miles south-south-westward of the light-structure at the head of Leksula baai. See also page 150.

Charts 942a, 2759a, 1263.

Chart 3241.

Coast.—Anchorage.—The coast between Tandjung Kabat Ha and Tandjung Batupekak (*Lat. 3° 51' S., Long. 126° 44' E.*), situated about 14 miles east south-eastward, is similar in character to that between 5 Tandjung Walwawat and Leksula baai. Tandjung Batutulis, which lies about 6½ miles east-south-eastward of Tandjung Kabat Ha, is a high rocky point, and is the most prominent mark eastward of Batu Kapal.

Anchorage may be obtained by vessels with local knowledge out of 10 the influence of the tidal stream, off the villages of Nalbesi and Wanala, situated about 2½ miles eastward and 10 miles east-south-eastward, respectively, of Tandjung Kabat Ha.

About 2½ miles within the southern extremity of Buru, and at the head of Baai van Namrole, is Wa Leli gebergte, the summit of which, 15 standing about 2½ miles north-westward of Tandjung Batupekak, is 1,812 feet (552^m3) high. Separated from the summit by a narrow depression, is a sharp peak, 1,040 feet (317^m0) high, situated about 7 cables east-south-eastward. On the western side of the ridge, and also separated from it by a depression, is a lower ridge, northward 20 of which is the inconspicuous peak Norolpitu, 2,609 feet (795^m2) high.

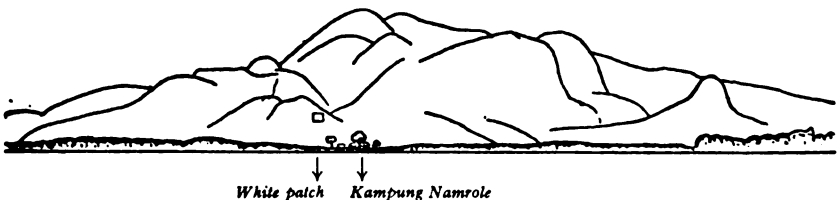
Baai van Namrole.—Danger.—This bay, entered between Tandjung Watina situated about 5 miles south-eastward of Tandjung Batutulis, and Tandjung Batupekak, may be identified by the plain of the Wai Tina delta, with a round-topped tree on the coast, on the 25 western side, and by the grey rocky cliffs of Tandjung Batupekak, about 160 feet (48^m8) high, with Klasi, a rocky islet, lying close westward of it.

Loktonal, a white coral bank, which partly dries, lies in the middle of the entrance. Kampung Namrole, off which there is no shore reef, 30 stands on the north-western shore of the bay. The rounded coastal hills situated eastward of the village are noticeable as they are of a lighter colour than the adjacent land.

A strong stream sets in the deep channel between Klasi and the coast.

Anchorage.—Directions.—Anchorage may be obtained by vessels 35 with local knowledge, in a depth of 16 fathoms (29^m3), sand and coral, in Baai van Namrole.

A vessel should approach the bay with the summit of Wa Leli gebergte bearing 000°, in line with Kampung Namrole, which, however,



Summit of Wa Leli in line with rounded-topped tree in Kampung Namrole, bearing 000°.

(Original dated 1933.)

40 is difficult to distinguish at a distance; if the summit is obscured by cloud a useful alternative mark, on the same bearing, is a large round-topped tree which, on nearer approach, will be seen between two native

Charts 942a, b, 2759a, 1263.

Chart 3241.

houses in the village; after passing westward of Loktonal on this leading line, she should steer for a white patch, situated about half a mile south-south-westward of the summit of Wa Leli gebergte, in line with a prominent knob on a lower ridge behind it, bearing 340° , which will lead to the anchorage. 5

Coast.—Between Tandjung Batupekak and Tandjung Liboli, situated about 30 miles east-north-eastward, a massive ridge of mountains lies parallel to the coast, and attains an elevation of 5,677 feet (1730^m) at its north-eastern end in Batak Bual, which stands 10 miles northward of Tandjung Liboli. The higher peaks of this ridge are usually obscured by clouds. Two peaks, 2,022 and 2,196 feet (616^m and 669^m) high, situated about 2 miles north-north-westward and $3\frac{1}{2}$ miles northward, respectively, of Tandjung Salia, which lies about 14 miles east-north-eastward of Tandjung Batupekak, are good marks. The coast is bordered by an almost unbroken sandy beach, with low plains behind it. 15

Off-lying islet and dangers.—Oki, an islet, 490 feet (149^m) high, and thickly covered with vegetation, lies about one mile offshore about 7 miles east-north-eastward of Tandjung Batupekak. Some rocks lie close southward of the islet. 20

Between Tandjung Batupekak (*Lat. $3^\circ 51' S.$, Long. $126^\circ 44' E.$*) and the islet Oki there is a ridge of reefs, with depths of from 16 feet to 6 fathoms (4^m to 11^m) over them, lying from about one to $1\frac{1}{2}$ miles offshore. Wajio riffen (Wayio reefs), with a least depth of 13 feet (4^m) over it, lies with its south-western and shoalest part 2 miles east-south-eastward of Oki. Belobo, reef which dries, lies about $1\frac{1}{2}$ miles west-south-westward of Tandjung Salia. 25

Anchorage.—Good anchorage may be obtained by vessels with local knowledge, over a sandy bottom, anywhere within the ridge of reefs between Tandjung Batupekak and Oki. Rede Oki, between the islet Oki and the coast northward, affords anchorage to vessels with local knowledge, but there is a 16-foot (4^m) coral patch in the middle of it. 30

A vessel proceeding to Rede Oki or to an anchorage westward of it should pass eastward of the islet Oki and thence between it and the 16-foot (4^m) patch northward of it. If proceeding eastward from Rede Oki a vessel can pass between Wajio riffen and the rocky Tandjung Wajio, lying northward of it, keeping moderately close to the latter. 40

Anchorage may be obtained by vessels with local knowledge, in a depth of 23 fathoms (42^m), during the North-West monsoon, in the bight off Kampung Wamsisi, close northward of Tandjung Salia, where the sea is calm. Also off Tandjung Polisini, situated about 10 miles north-eastward of Tandjung Salia, close westward of the mouth of Wai Lumara, in depths of from 27 to 33 fathoms (49^m to 60^m). 45

Tidal streams.—The tidal streams set parallel to the coast. Eddies are experienced off Tandjung Salia, and between Tandjung Liboli and Ambelau, an island which lies about $8\frac{1}{2}$ miles southward; these whirlpools are caused by the east-going tidal stream through the passage meeting the south-going stream in Straat Manipa. During the West monsoon there is sometimes a strong drift setting eastward in this passage, and westward during the East monsoon. 50

Charts 942a, 2759a, 1263.

Chart 3241.

Ambelau.—This island rises nearly vertically from the sea on all sides, attaining an elevation of 1,992 feet (607^m1) in Baula, in the western part of the island. The only flat parts of the island are at 5 Kampung Waloa, on the south coast, where there is a small inlet, which



Ambelau, bearing 350°, 30 miles.

(Original dated 1933.)

dries, available for praus, and at the villages of Negeri Baru and Ulima, on the north coast, where there are small sandy beaches. The island is wooded, and wild hogs abound.

EASTERN SIDE OF BURU.—Coast.—Between Tandjung 10 Liboli (*Lat. 3° 40' S., Long. 127° 11' E.*) and Baai van Kajeli (page 126), the eastern side of Buru is mountainous and desolate, with spurs reaching the coast in the vicinity of the rocky points Tandjung Liboli, Tandjung Saroma, which lies about 2 miles east-north-eastward, and Tandjung Tapan, situated about 1½ miles farther north-eastward, 15 and also eastward of the southern side of Baai van Kajeli. In between there is gently sloping land with sandy beaches. A hill, 513 feet (156^m4) high, which stands just within Tandjung Pohonrea, and about 5 miles north-north-eastward of Tandjung Tapan, is prominent. Fatu Kapal, a rock situated close offshore, about 8 cables north-north- 20 eastward of Tandjung Tapan, is seldom visible.

Kak Remat, 3,275 feet (998^m2) high, which stands 3½ miles north-westward of Tandjung Tapan, disappears from view when Tandjung Saroma has been rounded from southward. Batak Bual, the highest peak in this mountainous region, has been mentioned on page 131. 25 Kukusan, which stands about 5½ miles northward of Batak Bual, has two cone-shaped peaks, the higher and the southern of which is 2,032 feet (619^m4) high.

Anchorage.—Anchorage may be obtained by small vessels with local knowledge, in depths of from 27 to 38 fathoms (49^m4 to 69^m5), off 30 Kampung Ilat, situated about 1½ miles southward of Tandjung Pohonrea, out of the tidal streams, with Tandjung Pohonrea in line with Tandjung Kajuputih (Kayuputih), which lies about 10 miles northward, bearing about 007°. A vessel should approach with an isolated hut, situated close northward of the village, in the middle 35 of the shore of the bay, bearing 270°. The mouth of a creek lies close southward of the hut, and close northward of it is a fairly large tree with coconut trees in front of it. In calm weather, a vessel can anchor farther southward, nearer Kampung Ilat, in depths of from 19 to 22 fathoms (34^m7 to 40^m2).

40 Anchorage may also be obtained off Kampung Batudjungko (Batujungko), situated about 2½ miles south-south-westward of Tandjung Kajuputih, about one cable north-eastward of some detached rocks which lie close northward of the village, in a depth of about 11 fathoms (20^m1).

45 **Tidal streams.**—Strong tidal streams set along the eastern coast of Buru, a maximum rate of 3 knots having been observed 5 days after

Charts 942a, 2759a, 1263.



*Tifu baai,
bearing 000°, about 4 miles.*

South coast of Buru.—Approach to Tifu baai from southward.

(Original dated 1933.)



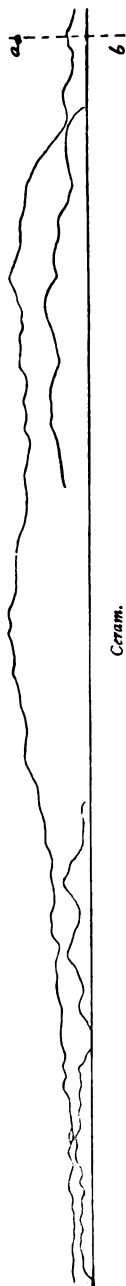
Manipa, bearing 337°, 28 miles.

(Original dated 1933.)



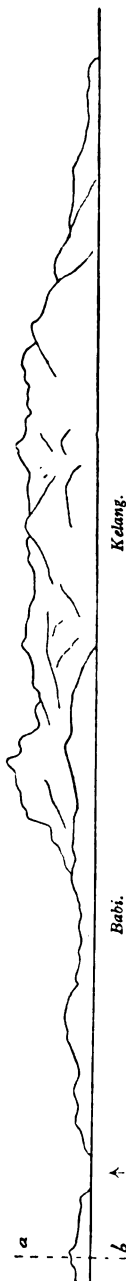
Boano, bearing 225°, 13 miles.

(Original dated 1933.)



Tonu
bearing 192° , 11 miles.
↓

2,827 feet.
↓



Babi.

Lobang Hajin.

View, in two parts, of Kelang and western end of Ceram from northward.
(Original dated 1933.)



(Original dated 1933.)

Chart 3241.

new moon with the stream setting north and north-west, and one knot with the stream setting south and south-west, which was of shorter duration than the former.

ISLANDS AND CHANNELS BETWEEN BURU AND CERAM.—**Straat Manipa.**—**Tidal streams.**—This wide passage connecting Ceram and Banda seas, lies between the eastern end of Buru and Manipa, and is clear of dangers in the fairway. Strong tidal streams set through this strait and the other channels between Buru and Ceram. When proceeding from north to south during the South-east monsoon it is advisable to keep to the Buru side, and during the North-west monsoon to the Manipa side. In the strength of the monsoons, however, when there may be a high sea running, preference should be given to Straat Kelang. 5 10

Manipa.—**Light.**—**Anchorage.**—This island is mountainous; Kala Huhun, its summit, has two peaks, the north-western and higher having an elevation of 2,071 feet (681^m3). There is a small plain on the southern side of the island, where there are a few villages. Masawoi and Asamamanuke, close westward of it, are islets lying on a reef close off the northern coast, and Luhu and Tuban lie close off the north-eastern and southern coasts, respectively. There is a channel between Tuban and the coast, which is accessible to vessels with local knowledge. A shoal, with a least depth of 6 feet (1^m8) over it, lies about three-quarters of a mile westward of Tuban, and foul ground, with a depth of 15 feet (4^m6) at its outer end, extends nearly one mile southward from the same islet. See view facing page 132. 25

A light (*Lat.* 3° 18' S., *Long.* 127° 28' E.) is exhibited, at an elevation of 305 feet (93^m0), from a white iron framework structure, 69 feet (21^m0) in height, from the north-eastern summit of Suanggi, an islet lying nearly one mile westward of Tandjung Hapale, the western extremity of Manipa. 30

Anchorage may be obtained off the western and southern coasts of Manipa; the best anchorage is off the north-western coast in Rede Hajasa, situated in the bight between Tandjung Hapale and Tandjung Hakuluane about 3 miles north-eastward, in depths of from 9 to 25 fathoms (16^m5 to 45^m7); the head of the bight is encumbered with drying reefs and shoals; Rede Hajasa offers fair shelter in the South-east monsoon. Anchorage is not recommended off the north-eastern coast owing to the strong tidal streams, which set along that coast; a rate of from 5 to 6 knots has been observed north-westward of Tandjung Samala, the south-eastern extremity. 40

Kelang.—**Tidal streams.**—**Anchorage.**—This island is mountainous and sparsely populated. Tonu, its summit, is an old volcano, 2,714 feet (827^m3) high. Solè, the largest village, is on its north-eastern coast. Kelang is separated from the north-eastern side of Manipa by Straat Kelang, which is 4½ miles wide. See views facing page 133. 45

A maximum rate of the tidal streams of from 5 to 6 knots has been observed in the strait off Tandjung Saniani, the western extremity of Kelang, and Tandjung Samala.

Anchorage may be obtained off the northern coast, westward of Tandjung Batugoso, the northern extremity of the island, except during the strength of the North-west monsoon; also off Kampung Pamariki, situated about 2½ miles westward of Tandjung Lalola, 50

Charts 942a, 2759a, 1263.

Chart 3241.

the south-eastern extremity of the island. Anchorage may be obtained off the eastern coast, northward of the parallel of Tonu.

- Babi, an island lying close off the north-eastern side of Kelang, is 5 hilly, but relatively low. Its eastern end is separated from Tandjung Haja (Haya), the western extremity of Ceram, by Lobang Haja (Lobang Haya), a narrow passage, which should only be used by small vessels with local knowledge, with a draught of not more than 11 feet (3^m4); the tidal streams in it attain a maximum rate of 6 knots. 10 Two shoals with depths of 9 feet and 2 fathoms (2^m7 and 3^m7) over them, lie, respectively, about 6½ and 4 cables southward of Tandjung Haja. Lobang Solè, the narrow passage between Kelang and Babi, should not be attempted on account of the strong tidal streams, which sometimes cause heavy eddies.

- 15 **Directions.**—Approaching Lobang Haja from southward steer to make good a course of 015° with Tandjung Haja on that bearing, passing westward of the two shoals mentioned above, until a course of 357° will pass about half a cable westward of Tandjung Haja, then steer to make good that course past the point and through the strait.

- 20 **Boano.**—**Dangers.**—This island, which lies about 8 miles north-north-eastward of Kelang, is high and serrated on its western side; it has a distinctive small cone, 2,045 feet (623^m3) high, on this side, but its flat eastern side is not more than about 200 feet (61^m0) high. Tandjung Hatu Alang, the south-western extremity, is rocky and 25 prominent. Pua, an island, 1,320 feet (402^m3) high, lies close off the north-western side of Boano, the passage between being encumbered with reefs; the northern end of the passage leads into an inlet, but it is not navigable on account of the reefs in it. See view facing page 132.

- A 6-fathom (11^m0) patch lies about 2 miles north-westward of the 30 south-western extremity of Pua (*Lat.* 2° 57' S., *Long.* 127° 53' E.), and a 5-foot (1^m5) patch lies about 1½ miles north-north-westward of the same point. Between these patches and Pua there are other dangers. Shoals, with depths of from 19 to 26 feet (5^m8 to 7^m9) over them, lie about 1½ miles off the western side of Boano southward of Pua; 35 this coast should not be approached within 3 miles.

Boano is sparsely inhabited, the two principal villages being on the south-eastern coast.

Charts 3241, 3242.

- CERAM.**—A range of mountains of irregular formation and with 40 numerous peaks, extends throughout the entire length of the island and attains its maximum elevation in the middle, but from a distance there are few landmarks. A coastal reef extends offshore in places, but vessels can generally navigate close to the coast. Earthquakes occur frequently, but are felt less frequently on the north coast than on the 45 south. Volcanic mud is found near the oil fields at Bula (page 141) on the east coast. Definite volcanic eruptions are unknown, but destructive earth tremors have been experienced at times.

The tidal streams, except in the straits and narrows, are weak.

Chart 3241.

- 50 **WESTERN SIDE OF CERAM.**—**Straat Boano.**—Straat Boano, between Boano and the coast of Ceram, is about 4½ miles wide and clear of dangers in the fairway, but at its south-western end, the navigable

Charts 942a, 2759a, 1263

Chart 3241.

channel is reduced to a width of about 3 miles by several islets and shoals which extend from the north-western side of Schiereiland Hoalmoal.

A vessel from northward, after passing Tandjung Pamali, the low north-eastern extremity of Boano, off which there is a 10-foot (3^m0) patch, should keep on this side of the strait as far as Tandjung Henaputih, the steep south-eastern extremity. The land within the coast of Ceram is mountainous and wooded, but without any outstanding peaks. The only noticeable hills on this coast are Asaudi, 618 feet (188^m4) high, which stands about 8 miles north-eastward of Tandjung Haja, and a hill, 588 feet (179^m2) high, situated about one mile south-westward of Asaudi.

Between Tandjung Tanduru Besar, the prominent high and steep north-western extremity of Ceram, and Tandjung Haja, there are several inlets, off which there are many islets and dangers. The hills slope down to the coast in many places, but the shores of the larger inlets are marshy and bordered with mangroves. *See view facing page 136.*

Anchorage.—Anchorage may be obtained off Kampung Kawa, situated about 4½ miles south-south-westward of Tandjung Tanduru Besar, during the South-east monsoon, in a depth of about 16 fathoms (29^m3), mud, stones and sand, with Sirih, a rocky islet, situated close off Tandjung Nonoherana, which lies about 3 miles south-westward of Tandjung Tanduru Besar, bearing 347°. Elsewhere in this inlet there is good holding ground in any depth required. In depths of less than 5 fathoms (9^m1), the bottom slopes steeply to the sandy beach.

The large inlet eastward of Pulu Marsegu situated on the eastern side of Straat Boano nearly 7 miles south-westward of Tandjung Nonoherana (*Lat. 2° 54' S., Long. 128° 08' E.*), affords a better anchorage than that in Baai van Kotania southward of it, as it is clear of dangers. Anchorage may be obtained off the northern edge of the drying reef which extends westward from Tandjung Lalansoai, in depths of from 22 to 30 fathoms (40^m2 to 54^m9). The best anchorage in this inlet is in the north-eastern cove, in a depth of 20 fathoms (36^m6), off the mouth of Wai Tosu. A vessel entering this inlet from northward should avoid the drying reef which extends a short distance from Tandjung Wantebu, the northern entrance point. The muddy shore of the inlet is covered with mangroves.

Baai van Kotania, entered between Tandjung Lalansoai and Tandjung Tapi, which lies about 6 miles south-westward, is encumbered with numerous reefs. Kampung Kotania, situated at the head of the bay, can only be reached by small vessels with local knowledge. Anchorage may be obtained, in depths of from 22 to 27 fathoms (40^m2 to 49^m4), sand, in the outer part of the bay, westward of the alignment of the eastern extremity of Pulu Marsegu and Tandjung Wantebu, bearing 021°. A vessel of shallow draught can approach this anchorage from northward by passing between Pulu Marsegu and the drying reef on which are some islets, extending about 1½ miles from Tandjung Lalansoai, but there is a rocky reef, with a depth of 19 feet (5^m8) over it, on the Marsegu side of the fairway.

A vessel approaching Baai van Kotania from westward should steer for Buntal, a prominent islet, 290 feet (88^m4) high, on a reef, situated about 2 miles southward of Tandjung Lalansoai, bearing 090°, until the eastern extremity of Tikus, a low islet situated close off the southern

Charts 2233, 2224, 2214.

Chart 3241.

shore, about $1\frac{1}{4}$ miles eastward of Tandjung Tapi, is in line with Maruing, a mountain, 1,408 feet (429^m1) high, bearing about 149° , when she should steer 060° for the anchorage. Care must be taken not to get eastward of the alignment mentioned above.

Chart 911, plan of Asaudi road.

Anchorage may be obtained in Rede Asaudi, southward of Asaudi, an islet, 247 feet (75^m3) high, situated about $4\frac{1}{4}$ miles south-westward of Tandjung Tapi, in a depth of about 21 fathoms (38^m4), mud and sand, about $6\frac{1}{4}$ cables offshore westward of Kampung Asaudi.

Chart 3241.

Coast.—The coast between Tandjung Haja and Tandjung Sial, situated about 25 miles south-south-eastward, which forms the western side of Schiereiland Hoalmoal, can be approached closely everywhere southward of Lobang Haja (page 135): the only known dangers, other than the two shoals southward of Tandjung Haja, are a 29-foot (8^m8) shoal situated about $2\frac{1}{4}$ miles north-north-westward of Tandjung Sial and about half a mile offshore, and a rock, awash, which lies about 2 cables southward of Tandjung Sial. The western side of the peninsula is covered with forest and rises to mountainous land without any well defined peaks. There are few inhabitants, the only village of any importance being Supe, situated about $4\frac{1}{4}$ miles south-south-eastward of Tandjung Haja. The eastern side of the peninsula is described on page 143.

A strong tidal stream may set round Tandjung Sial, about 2 cables off which there is the dangerous rock awash, mentioned above. Elsewhere eastward of a line joining Tandjung Hatuluta, situated 5 miles north-north-westward of Tandjung Sial, and Tandjung Tohosou, on the southern side of Kelang, which lies about $5\frac{1}{4}$ miles westward of Tandjung Lalola (*Lat. $3^\circ 15' S.$, Long. $127^\circ 47' E.$*), the streams are weak, except in the approaches to Lobang Solè and Lobang Haja.

Chart 3242.

NORTHERN SIDE OF CERAM.—**Coast.**—Between Tandjung Tanduru Besar and Tandjung Namaä, a low point, lying about 54 miles eastward, the coast is clear of dangers, except for Telegraaf rif and Lasi (page 137). The mountains approach the coast in many places, interspersed with low plains, through which some rivers flow, and in which there are coconut plantations. There are many villages on this coast. Most of the coastal hills and mountains can be easily identified, the most prominent being Groote Dromedaris, 2,285 feet (696^m5) high, and Kleine Dromedaris, 1,550 feet (472^m4), situated about 23 and 25 miles, respectively, eastward of Tandjung Tanduru Besar. These mountains bear some resemblance to the hump of the animal after which they are named. Nakaëla, 2,600 feet (792^m5) high, standing about 4 miles west-south-westward of Groote Dromedaris, has a flat summit. Farther inland and within about 8 miles south-eastward of Groote Dromedaris are the Cecilia gebergte, which attain an elevation of 4,440 feet (1353^m3). Lumute gebergte is a long ridge situated about 8 miles eastward, and of about the same elevation as Cecilia gebergte, but is less outstanding.

Tidal streams.—**Current.**—The tidal streams close off this stretch of coast are moderate or weak, except off Tandjung Tanduru Besar, where they set strongly through Straat Boano.

Charts 942a, b, 2759a, 1263.

Batu Lasa,
bearing 251°, 16½ miles.

Boano.



↑
Tandjung Tanduru Besar.

Western part of north coast of Ceram from north-eastward.

(Original dated 1933.)

Wadukone.
↓
Soshulati.
↓



Rapinane.
bearing 192°, 3½ miles.

North coast of Ceram.—Approach to Sukaradja from northward.

(Original dated 1933.)

Selénan ghegile.

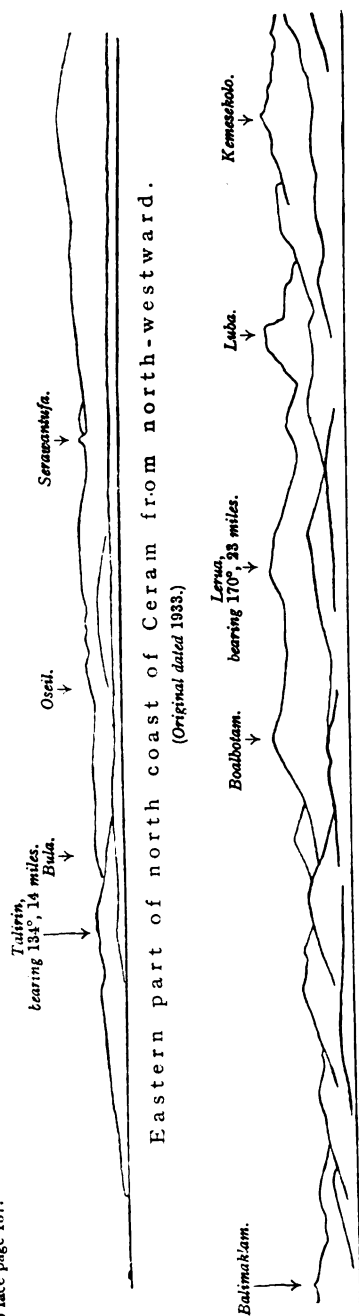


Ceram.

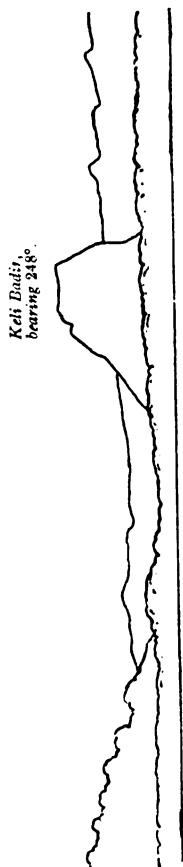
↑
Large tree
on Pulau Besar,
bearing 117°, 12 miles.

North coast of Ceram.—Tudjuh eilanden from west-north-westward.

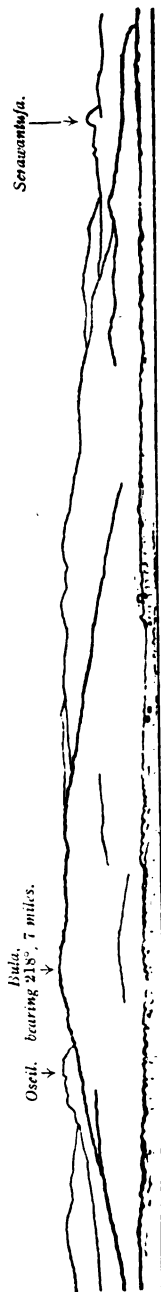
(Original dated 1933.)



Ceram.—Mountains from northward.
(Original dated 1933.)



Eastern end of Ceram from east-north-eastward.
(Original dated 1933.)



Ceram.—Approach to Bula baai from north-eastward.
(Original dated 1933.)

Chart 3242.

Off the northern coast of Ceram countercurrents prevail close inshore during the south-east monsoon.

Anchorage.—Anchorage may be obtained close off the mouths of the rivers between Tandjung Kalawai, situated about 6 miles eastward of Tandjung Tanduru Besar, and Tandjung Hanua, about 6 miles farther eastward, and close off all the points between the latter and the Tudjuh eilanden.

Temporary anchorage may be obtained in the following positions:—
 Off Kampung Noniali, situated about $2\frac{1}{2}$ miles eastward of Tandjung Hanua, in a depth of about 30 fathoms (54^m9), about one cable offshore. Westward of Tandjung Lamana, which lies about 10 miles eastward of Tandjung Hanua, in a depth of 24 fathoms (43^m9), coral and sand, about a quarter of a mile from the drying coastal reef. Northward of Tandjung Uli, situated about 9 miles eastward of Tandjung Lamana, in a depth of 30 fathoms (54^m9), coral and sand, about a quarter of a mile offshore. Off Kampung Sukaradja, situated about 3 miles east-south-eastward of Tandjung Uli, in a depth of 20 fathoms (36^m6), with Rapinane, a hill, 622 feet (189^m6) high, which stands about one mile south-south-westward of the village, bearing 192° . (See view facing this page.) Northward of Tandjung Makina, which lies $5\frac{1}{2}$ miles eastward of Tandjung Uli, in a depth of 30 fathoms (54^m9), coral and sand, about a quarter of a mile offshore. Off Kampung Lisabata, situated about half a mile eastward of the creek Wai Ela, situated about 7 miles eastward of Tandjung Makina, in a depth of 20 fathoms (36^m6), mud and sand, about $1\frac{1}{2}$ cables offshore.

Off-lying islands and dangers.—Tudjuh eilanden, consisting of six low, partly inhabited islands, planted with coconuts lie within 5 miles of the coast. On the northern end of Besar, the northernmost island of the group, there is a large fan-shaped tree. See view facing page 136.

Telegraaf rif, with a depth of 9 feet (2^m7) over it, lies nearly 3 miles north-westward of Tandjung Sapola (*Lat. $2^\circ 50' S.$, Long. $128^\circ 58' E.$*), situated about 13 miles eastward of Tandjung Makina. This danger and the reefs fringing the islands, especially that around Alai, situated about half a mile southward of Air, are well marked by discoloration. Lasi, a drying coral and mud bank, lying about half a mile offshore and $4\frac{1}{2}$ miles eastward of Telegraaf rif, is not usually marked by discoloration at high water.

A shoal, with a least depth of 16 feet (4^m9) over it, lies about 5 cables south-south-westward of Tengah.

The most suitable passage through Tudjuh eilanden, both by day and night, is that between Air and Tengah. Approaching from westward, the islands are difficult to distinguish at night against the background of the high coast of Ceram. From eastward, the islands can be safely approached on a clear night.

Seleman baai.—**Anchorage.**—This bay is entered between Tandjung Namaä and Tandjung Pamali, a low point, which lies about 19 miles eastward, with light-coloured hilly land behind it. At the head of the bay the mountains approach the coast, especially at, and westward of, the peninsula, on which stands Olat, a hill, 590 feet (179^m8) high, situated about 12 miles south-eastward of Tandjung Namaä. Lusiala, a pyramidal-shaped hill, 1,441 feet (439^m2) high, lies close inland, about 5 miles westward of Olat. Saka, or Piek van

Charts 1651, 2516, 2666.

Chart 3242.

Seleman, 4,893 feet (1491^{m3}) high, with a distinctive blunt summit, stands about 2½ miles southward of Lusiala. The two Putih summits, 5,437 and 6,313 feet (1657^{m2} and 1924^{m2}) high, separated from each other by a depression, stand about 3½ and 4½ miles south-south-westward of Olat, and are the spurs of the high land which extends about 20 miles east-south-eastward, and which rises gradually to Binaija (page 147). Sapolewa, a hill 700 feet (213^{m4}) high, lies on the south-eastern side of the bay, about 1½ miles inland, 5 miles east-
10 north-eastward of Olat. Elsewhere the western and eastern sides of the bay are bounded by a low plateau with hills.

There is excellent anchorage everywhere close offshore between Tandjung Pamali (*Lat.* 2° 48' S., *Long.* 129° 22' E.) and Baai van Besi, situated about 12 miles south-westward.

15 Anchorage may be obtained in Rede Paoni, which lies about 4½ miles southward of Tandjung Namaä, but there are four reefs, with depths of from 6 to 10 feet (1^{m8} to 3^{m0}) over them, not marked by discoloration, lying within 3 cables of the coast. There are several creeks northward of Kampung Paoni, only the northward of which
20 is accessible for boats, and that only for a short distance.

Anchorage may be obtained off Kampung Seleman, situated about half a mile eastward of Lusiala, with a large mosque bearing 206°, on which bearing a vessel should approach, which leads between two shoals, with depths of 16 and 29 feet (4^{m9} and 8^{m8}) over them, not marked
25 by discoloration, lying about 2½ and 3½ miles, respectively, eastward of Tandjung Talitetui, situated about 7½ miles southward of Tandjung Namaä.

Chart 930, plan of Baai van Sawai and Baai van Besi.

Baai van Sawai and Baai van Besi.—These bays lie on the
30 western and eastern sides, respectively, of the peninsula extending northward from the head of Seleman baai, and on which the hill Olat stands.

Baai van Sawai is sheltered on its northern side by an extensive drying reef, on which stand Radja and Sawai, low islets thickly
35 covered with mangroves.

A vessel approaching this bay should steer for the mosque in Kampung Seleman, bearing 206°, until the northern extremity of Radja bears about 076°, when she can alter course for the entrance, and pass close to Tandjung Hatu Supun and along the southern shore of the bay.

40 Baai van Besi is fronted by a number of reefs which dry, on which are Lusaolat and Lusahiti, low islets covered with coconut trees, and by Sialumaina, a sand bank covered with low shrubs, the positions of which may best be seen on the plan. The best approach is eastward of Lusaolat, the easternmost islet, but the passage westward of this
45 islet is also safe when the reefs are plainly visible.

Chart 930, plan of Baai van Wahai and Baai van Hatiling.

Baai van Wahai.—**Light.**—**Dangers.**—**Beacons.**—This bay, entered about 8 miles eastward of Tandjung Pamali, is formed by the western of the two gaps in the coastal reef lying between Tandjung
50 Lamakika, a low point situated about 7 miles east-north-eastward of Tandjung Pamali, and Tandjung Hewal, about 3½ miles east-north-eastward. The edge of the reef on the western side of the fairway is marked by two iron beacons, each surmounted by a white ball, and that on the eastern side by three iron beacons, each surmounted by a black

Charts 3242, 942b, 2759a, 1263.

Chart 930, plan of Baai van Wahai and Baai van Hatiling.

cone. A $1\frac{1}{2}$ -fathom (2^m7) patch lies about half a cable southward of the outer beacon on the eastern side of the entrance.

The limit of the roadstead is the arc of an imaginary circle with a radius of 3,281 feet (1000^m0), and the light structure as centre. 5

At the head of the bay there is a pier, on the head of which there is a white shed, and a light, which is exhibited, at an elevation of 22 feet (6^m7), from a mast. In 1953, the light was extinguished. Kampung Wahai stands on the slope of rising ground at the head of the bay, with the villages Hatuwu and Hatiling close westward of it. A vessel, 10
164 feet (50^m0) in length, with a draught of 10 feet (3^m0), can lie at the head of the pier, but in 1948, the pier was unserviceable.

Pamali, a hill, 177 feet (53^m9) high, which lies about 3 cables east-north-eastward of the head of the pier, is noticeable.

Rainfall.—See page 27.

Anchorage.—**Directions.**—Anchorage may be obtained in Baai van Wahai, with the western gable of the white shed on the pier in line with the middle of the three beacons surmounted by a cone, situated about 2 cables north-north-westward of the pier-head, bearing 154° , in depths of from 22 to 27 fathoms (40^m2 to 49^m4). 20

A vessel approaching the bay from westward or eastward will easily identify Tandjung Hewal (*Lat. $2^\circ 46' S.$, Long. $129^\circ 32' E.$*), which is low and covered with mangroves; if approaching from northward, Wahai is less easy to distinguish. At a distance of about 10 miles, in clear weather, Tandjung Hewal appears as an islet lying off the hilly 25
land southward, which extends eastward and westward and shows fairly plainly against the mountains farther inland. On opening the bay, the white shed on the pier, the zinc roofs of the buildings, and the flagstaff at Wahai will be seen. The vessel should approach the anchorage on the leading line mentioned above. 30

Baai van Hatiling.—**Dangers.**—This bay is entered between Tandjung Hewal and the reef extending $6\frac{1}{2}$ cables northward from Tandjung Aentopra, situated about $1\frac{1}{4}$ miles south-westward; although more spacious and easier to enter than Baai van Wahai, it is seldom visited. 35

Shoals, with depths of $3\frac{1}{2}$ and $4\frac{1}{2}$ fathoms (6^m8 and 8^m7) over them lie about 5 cables westward of Tandjung Hewal.

A reef, which dries, lies in the middle of the bay, eastward of Tandjung Aentopra; reefs with least depths of $3\frac{1}{2}$ fathoms (5^m9) over them, lie about three-quarters of a cable north-north-westward 40
and north-north-eastward, respectively, of it; about $1\frac{1}{4}$ cables eastward of the drying reef there is another small patch which also dries. Vessels, should pass westward of these reefs.

Chart 3242.

Coast.—Between Tandjung Hewal and Tandjung Lama, which lies 45
about 50 miles east-south-eastward, the coast is low and uniformly covered with vegetation, and is fringed by a narrow, steep-to bank, which dries nearly everywhere, consisting principally of mud and sand; coral only occurs occasionally. The thick vegetation, which usually grows as far as the high-water line, makes it difficult to identify the 5
points of land unless navigating close offshore.

Within the coast there is a wide plain with low hills, which ascends farther inland to uniformly higher land, of which the only noticeable features are Tomo, 1,333 feet (406^m3) high, standing $8\frac{1}{2}$ miles south-

Charts 942a, 2759a, 1263.

Chart 3242.

south-westward of Tandjung Hewal, and Talirin, a double-peaked mountain, of which its higher and southern peak has an elevation of 887 feet (270^m4), situated about 3½ miles south-south-eastward of
 5 Tandjung Lama. Farther inland, Luba, a blunt peak, 3,335 feet (1016^m5) high, about 2½ miles westward of Lerua, situated 29 miles south-westward of Tandjung Lama, and Balimaklam, 2,954 feet (900^m4) high, with a small conical peak on a mountain ridge, 9½ miles eastward of Lerua, are the most prominent mountains. See views
 10 facing page 137.

The best positions for anchoring are in the bights off the small villages of Pasahari, which lies 7½ miles east-south-eastward of Tandjung Hewal, Seliha, at the head of a bay, situated about 11 miles farther south-eastward, and Bengoi, near the head of a bight situated
 15 about 10 miles westward of Tandjung Lama. There are several rivers which flow out on this coast, but they can only be entered by boats on account of their shallow bars.

Tandjung Lama and Tandjung Bobo, situated about 2 miles east-south-eastward, are low and distinctive, with steep-to coastal banks
 20 of mud and sand. The bight formed between these points affords sheltered anchorage during the South-east monsoon, in a depth of 23 feet (7^m0), north-north-eastward of the mosque in Kampung Hoti, situated at the head of the bight.

Tidal streams.—The tidal streams close offshore are moderately
 25 strong; in depths of over 100 fathoms (365^m8) the monsoon drift may be experienced. In June a constant easterly stream with a rate of one knot has been observed off the north-eastern extremity of Ceram.

Off-lying danger.—Leeuwarden rif or Karang Bais, which dries
 30 and is marked by discoloration, lies about 6 miles east-north-eastward of Tandjung Lama; this reef is steep-to.

EASTERN SIDE OF CERAM.—Coast.—Anchorage.—Between Tandjung Bobo and Tandjung Ilor (*Lat. 3° 25' S., Long. 130° 48' E.*), which lies about 36 miles south-eastward, the coast is bordered by an
 35 alternately wide and narrow low plain, which rises within to hilly land with an occasional salient peak; of these, besides Talirin (described above), there are Bula, 1,602 feet (488^m3) high, which stands 9½ miles south-eastward; a hill, 385 feet (117^m3) high, with a prominent tank on it, situated about 8 miles south-south-eastward of Bula; two peaks
 40 487 and 438 feet (148^m4 and 133^m5) high, situated about 5 and 6½ miles, respectively, farther south-south-eastward; and Keli Dukun, 319 feet (97^m2) high, standing about 4½ miles westward of Tandjung Ilor. See views facing this page.

Farther inland, about 6½ miles westward of Bula, are Serawantufa
 45 or Fat Eli, 1,681 feet (512^m4) high, which is distinctive from north-eastward owing to its conical shape; the Waelila gebergte, the south-eastern peak of which, situated 16½ miles westward of Tandjung Ilor, is more obvious than the north-western; and Keli Badir, 966 feet (294^m4) high, with a steep cone rising in the midst of inconspicuous
 50 hills, standing 6½ miles south-westward of Tandjung Ilor.

Except along the southern shore of Waru baai (*see below*) the coast is clear of dangers outside its steep-to drying bank, which consists mostly of mud and sand. There is, however, a 10-foot (3^m0) patch lying close

Charts 942b, 2759a, 1263.

Chart 3242.

offshore about $3\frac{1}{2}$ miles southward of Tandjung Bolifar, a low point situated about 17 miles south-eastward of Tandjung Bobo.

Several rivers flow out between Tandjung Lama and Waru baai, but they are of no importance to navigation. The principal place on this sparsely inhabited coast is Bula. Good anchorage may be obtained anywhere off this coast during the North-west monsoon and in the transition months.

Chart 930, plan of Ingelas baai.

Ingelas baai.—**Anchorage.**—This bay is entered between Tandjung Tufa, situated about $4\frac{1}{2}$ miles south-eastward of Tandjung Bobo, and Tandjung Sisal, which lies about 2 miles farther south-eastward. The shores are low, but rise close within, and are bordered by a narrow bank of mud and sand which is steep-to. During the South-east monsoon the sea is calm, and during the North-west monsoon it is more sheltered than in Bula baai, in which there may be a high sea.

Anchorage may be obtained, in depths of from $6\frac{1}{2}$ to 7 fathoms (11^m9 to 12^m8), about 3 cables offshore. A vessel should enter with Serawantufa (chart 3242) bearing 220° , taking care to avoid the mud and sand spit which extends about $1\frac{1}{2}$ cables from Tandjung Sisal.

Chart 911, plan of Bula bay.

Bula baai.—**Light.**—**Anchorage.**—Bula baai, entered between Tandjung Waelolo, which lies about $1\frac{1}{2}$ miles south-eastward of Tandjung Sisal (*Lat. $3^\circ 03' S.$, Long. $130^\circ 28' E.$*), and Tandjung Namatimor, situated about $4\frac{1}{2}$ miles farther south-eastward, can be identified from a considerable distance by the red roofs of the settlement and some tanks at the head of the bay. *See view facing page 137.*

There is a stone pier, about $2\frac{1}{2}$ cables in length at Bula, with a depth of about $4\frac{1}{2}$ fathoms (8^m2) at its head, a light is occasionally exhibited from the head and a flagstaff stands near the root of the pier.

The limit of the roadstead is the arc of an imaginary circle with a radius of one mile and the root of the pier as centre.

Anchorage may be obtained, in a depth of about 12 fathoms (21^m9), soft mud, with the pier-head bearing 174° , distant about 2 cables. A vessel approaching from southward or eastward should steer for Serawantufa (chart 3242) bearing 248° until the pier is identified. The holding ground is not so stiff as it is in Ingelas baai.

Owing to the existence of oil fields in the neighbourhood, Bula has developed into an important settlement. There is a medical officer and a hospital.

Fresh water and fuel oil can be obtained from pipes laid on to the pier. Fresh provisions may possibly be procured, preserved food can be obtained in any quantity. Vessels up to 13,000 tons can moor alongside the pier.

Chart 3242.

Waru baai.—**Anchorage.**—This bay lies at the head of the bight entered between Tandjung Meer, situated about 8 miles southward of Tandjung Bolifar, and Tandjung Ilor. The southern shore is fringed by a coral reef, which extends as much as one mile offshore.

Off Kampung Waru, situated at the head of the bay, where there is a small pier, there is no coastal reef, but there is a sandy beach which dries out to a distance of about one cable at low water, when the pier cannot be reached by boat. Vessels may obtain anchorage, in a depth of about 16 fathoms (29^m3), mud, off Kampung Waru. A number of

Charts 942b, 2759a, 1263.

Chart 3242.

small villages stand in coconut plantations on the shores of Waru baai and northward of it.

Off-lying island.—Parang, an island 450 feet (137^m2) high, lies 5 about 4½ miles northward of Tandjung Ilor, with a clear channel in the fairway between. It is surrounded by reefs which mostly dry, and, on the north-western side, lie about one mile offshore, and are steep-to.

Tidal streams.—The tidal stream off the east coast of Ceram sets northward or north-eastward with the rising tide, and in the contrary 10 direction with the falling tide.

Coast.—Anchorages.—Tandjung Ilor is low, but there are some high casuarina trees on it, which render it distinctive. The coast between this point and Tandjung Danama, situated 11½ miles south-south-eastward, is occupied by the wide plain of the Wai Masiwang. 15 Keli Badir (page 140), which lies 6½ miles south-westward of Tandjung Ilor, is inconspicuous from south-eastward. A prominent tree stands on the coast about 3½ miles southward of Tandjung Masiwang.

Urlin rif lies about three-quarters of a mile eastward of Tandjung Masiwang and a 16-foot (4^m9) patch lies about one mile east-south- 20 eastward of the same point. Foul ground lies within 2 miles of the coast between this point and Tandjung Danama, and it should not be approached in a depth of less than 16 fathoms (29^m3). It is exceptionally foul with very muddy water within the 10-fathom (18^m3) line. Akat, a low but distinctive islet, covered with coconut 25 trees, and fringed by a reef, lies about 1½ miles offshore and 3½ miles northward of Tandjung Danama. A 19-foot (5^m8) patch lies about 3½ cables east-south-eastward of this islet. Except southward of Akat, this coast is practically inaccessible owing to the off-lying reefs.

Small vessels with local knowledge can obtain anchorage, in depths of 30 from 22 feet to 5 fathoms (6^m7 to 9^m1), off the pier, which has a depth of 8 feet (2^m4) at its head, at Kampung Air Kasar, situated about 2½ miles north-north-westward of Tandjung Danama (*Lat.* 3° 35' S., *Long.* 130° 53' E.). The channel leading to the pier lies between drying reefs. Larger vessels may obtain anchorage, in a depth of 35 15 fathoms (27^m4), south-eastward of Akat. There are distinctive mosques at Kampung Anglu, situated about 1½ miles north-westward of the pier at Air Kasar, and near the villages of Kilbad and Kilmui, which stand on the coast about 6 and 8 cables, respectively, south-eastward of the pier.

40 A detached 13-foot (4^m0) patch lies nearly half a mile offshore, about one mile southward of Tandjung Danama.

Between Tandjung Danama and Tandjung Kopeng Watu, situated 12½ miles southward, the coast is low, bordered with mangroves, and interspersed with coconut plantations, but rises close within to moun- 45 tainous land. A somewhat prominent peak, 1,691 feet (515^m4) high, lies 3 miles west-south-westward of Tandjung Danama. Selagor, 2,600 feet (792^m5) high, situated about 5 miles north-north-westward of Tandjung Kopeng Watu, is distinctive from eastward, from which direction it has the form of a cheese cover, with the highest part in the 50 middle. The peaks farther southward are described on page 148.

Coast.—Anchorage.—Between Kampung Kilgah, situated 2½ miles southward of Tandjung Danama, and Tandjung Kopeng Watu, there is no coastal reef, and in places there is a sloping sandy beach, on which, in favourable circumstances, landing can be effected. At

Charts 942a, 2759a, 1263.

Chart 3242.

Kampung Kilgah, a spur of the coastal reef, which dries 8 feet (2^m4) at its extremity, extends south-westward, and affords shelter to praus.

The coast between Tandjung Kopeng Watu, the only rocky point on this coast, and the south-eastern extremity of Ceram, situated about 5 miles south-south-eastward, is uniformly bordered with mangroves. The latter point is the termination of a low and marshy peninsula, intersected by creeks, and fringed by a drying reef. Some detached patches, with depths of from 2 to 13 feet (0^m6 to 4^m0) over them, lie within half a mile of the coast about midway between these two points.

There are no good anchorages on this stretch of coast, but a vessel with local knowledge could obtain a temporary anchorage in the bight off Kampung Arnanan, situated 3 miles southward of Tandjung Kopeng Watu, sheltered in both monsoons, and out of the influence of the tidal stream.

Off-lying islet.—Madorang is a low islet covered with trees, lying, on the south-western side of a drying reef which is steep-to, about 11 miles east-south-eastward of Tandjung Danama.

For Ceram Rei and the islands eastward of it, *see* page 160, and for the southern coast of Ceram, westward of Ceram Rei, *see* pages 147-148.

Charts 3241, 3242.

SOUTHERN SIDE OF CERAM.—Piru baai.—Dangers.—Beacon.—Piru baai lies eastward of Schiereiland Hoalmoal, and is fronted by Eiland Ambon. A ridge of mountains, of which Sahuai, 3,472 feet (1058^m2) high, situated about 22 miles north-north-eastward of Tandjung Sial, the southern extremity, is the summit, extends through the entire length of the peninsula; this mountain, like the other peaks, is only moderately distinctive. The eastern side of the peninsula northward of Tandjung Aiputih, situated about 16 miles north-north-eastward of Tandjung Sial, is not so steep as the western side. Tandjung Batu Kapal, which lies about 2½ miles south-westward of Tandjung Aiputih, can be identified by an isolated rock lying close off it.

Kasa, a low flat islet, covered with vegetation, lies about 5½ miles north-eastward of Tandjung Aiputih. An extensive reef, marked by discoloration, which dries only at the lowest water level, lies between Kasa and Babi.

The narrower part of the bay, northward of Babi (*Lat.* 3° 13' S., *Long.* 128° 10' E.), an islet, 427 feet (130^m1) high, situated on the eastern side of the entrance of this part, is backed by moderately high mountains, especially on the eastern side, on which there are some prominent peaks for a vessel approaching from southward, the most noticeable being Huhula, 2,107 feet (642^m2) high, the highest peak, which is thickly covered with vegetation, standing about 3¾ miles north-north-eastward of Babi; Henhuhui, 1,054 feet (321^m2) high, and a peak, 1,010 feet (307^m8) high, situated about half a mile west-south-westward of it, about 1½ miles north-north-eastward of Babi. From southward, the two latter peaks have a regular cone-shaped appearance, and like the hills southward of them, have little growth on them. Maruing, with a double peak, 1,408 feet (429^m1), situated on the western side of the bay, about 8 miles north-westward of Babi, is similar in appearance to Henhuhui and the peak west-south-westward of it. Sahuai, the summit of Schiereiland Hoalmoal, has been described above.

Charts 942a, 2759a, 1263.

Charts 3241, 3242.

Tandjung Murua and Tandjung Tapan, situated about one and 2 miles respectively, north-north-westward of the northern extremity of Babi, are steep-to. Tandjung Sisi, which lies about $1\frac{1}{2}$ miles northward of Tandjung Tapan, is fringed by a reef. Tandjung Tutunaten, situated about $1\frac{1}{2}$ miles north-north-eastward of Tandjung Sisi, is covered with trees, and is rendered obvious by a hill, 401 feet (122^m2) high, standing about half a mile within it, which is connected to Huhula by a ridge. These points are from about 200 to 500 feet (61^m0 to 152^m4) high.

10 The eastern shore of the bay northward of them, unlike the western shore of the inner part of the bay, is bordered by a wide plain, which becomes narrower as it extends northward until westward of Piru.

An 8-foot (2^m4) patch lies about $2\frac{1}{2}$ miles north-westward of the south-western extremity of Babi. Tetu, a reef which dries and is marked by discoloration, lies close northward of this patch. Sasadu, a reef, which dries, lies about $2\frac{3}{4}$ miles west-north-westward of Tandjung Tapan; it is marked on its southern side by an iron beacon, surmounted by a white ball. A 3-fathom (5^m5) patch, marked by discoloration, lies close off Tandjung Terua, about $1\frac{1}{2}$ miles east-north-eastward of Tandjung Tutunaten.

Tidal streams.—The stream sets in the same direction on both sides of Kasa, this is probably not a tidal stream, but a current which enters the bay on one side and out on the other, the direction being dependent on the wind. During the survey, in the month of February, there was a continual stream setting out of the bay, at a rate of nearly one knot, with a constant north-westerly wind, which at times increased suddenly to a force of 6. In Rede Piru (*see below*) during the survey, in the first half of February, there was a constant southerly set with a maximum rate of half a knot.

Chart 3241.

Anchorage.—**Directions.**—**Beacons.**—Anchorage may be obtained off Kampung Luhu, situated 3 miles west-south-westward of Tandjung Batu Kapal (*Lat.* $3^{\circ} 22' S.$, *Long.* $128^{\circ} 01' E.$), in a depth of about 22 fathoms (40^m2), sand, outside a detached reef, with the mosque bearing 250° . This mosque can be distinguished from the mosque in Kampung Iha, close southward of it, as it has a dome-shaped zinc roof, and the one in Kampung Iha a conical roof.

There is a small pier at Kampung Iha, with a depth of 16 feet (4^m9) at its head.

Charts 3241, 3242.

Anchorage may be obtained by small vessels with local knowledge, in Rede Loki, which lies 3 miles northward of Tandjung Aiputih, in a depth of about 13 fathoms (23^m8). The anchorage is situated in an opening in the drying coastal reef southward of Kampung Loki, which can be identified by a church standing on the beach. In the middle of the opening there is a reef which is marked by a beacon, surmounted by a rectangle. Vessels should pass northward of this beacon on entering.

The coastal reef on the southern side of the entrance is also marked by a beacon.

50 **Rede Piru.**—**Dangers.**—**Light.**—**Beacon.**—This roadstead is situated off the village of the same name at the head of Piru baai. The limits of the roadstead are the parallel of $3^{\circ} 05' S.$, and the meridian of $128^{\circ} 11' E.$

A reef, which dries, situated about $8\frac{1}{2}$ cables south-south-westward of

Charts 942a, 2759a, 1263.

Charts 3241, 3242.

the head of the pier at Piru, is marked on its western side by a beacon with a white ball. A 5-fathom (9^m1) patch lies about 2 cables west-north-westward of the reef. The approach to the pier lies between two reefs which extend from the shore on either side of it. 5

A light is occasionally exhibited at the pierhead.

There are two small sheds on the head of the pier, alongside which there is a depth of 10 feet (3^m0).

A vessel approaching the roadstead should pass westward of the beacon and the 5-fathom (9^m1) patch, and thence steer for the western 10 side of the head of the pier, bearing 033°, and anchor, in a depth of about 16 fathoms (29^m3), about 3½ cables south-south-westward of the pier-head.

There is a medical officer at Piru.

Chart 3242.

15

Coast.—Anchorage.—On the northern side of the bight between Tandjung Haturusun, a steep rocky point, situated nearly a mile east-south-eastward of the south-eastern extremity of Babi, and Tandjung Tutualmatwai, a low point covered with high trees, about 7 miles farther east-south-eastward, is the high land southward of 20 Huhula; this coast is indented by several inlets, off which are some drying reefs. Fronting Telok Latal, the westernmost of these inlets, there is a detached drying reef, the south-western extremity of which is separated from the detached drying reef lying southward of Babi (page 143) by a patch which dries about 5 feet (1^m5) and on which there 25 is a small outstanding tree.

The eastern shore of Piru baai, from Tandjung Aru, situated about 5 miles east-north-eastward of Tandjung Hatunusun, to Tandjung Hatumeten, which lies about 12½ miles south-south-eastward, is low and steep-to. About 5 miles east-north-eastward of Tandjung 30 Tutualmatwai (*Lat.* 3° 16' S., *Long.* 128° 18' E.) there is a mountain, 1,349 feet (411^m2) high, with a round-topped tree on its summit.

Temporary anchorage may be obtained close off this shore in a few places. The principal villages, although small, are Waisamu, Hatusua and Kairatu, the positions of which may best be seen on the chart. 35

Straat Ceram.—Straat Ceram, separating Haruku and Saparua, islands of the Ambon group (page 149), from the southern side of Ceram, is clear of dangers in the fairway. There is usually a moderate west-going current in the strait. On the northern side the mountains lie close to the coast, the most dominant being Toplana, 4,414 feet (1345^m4) 40 high, and the conical Totaniwel, 4,132 feet (1259^m5) high, about one mile south-eastward, situated about 7½ miles eastward of Tandjung Hatumeten. The narrow coastal strip and the points are low.

The only anchorage outside the influence of the current is in Baai van Tuhaha, on the northern side of Saparua (*see* page 154). Anchorage 45 may be obtained off the Ceram coast, off the villages of Seruawan, situated about 3 miles south-south-eastward of Tandjung Hatumeten, Tihulale and Rumakai, about 7 and 8 miles respectively, farther eastward, but the bottom is steep, and off the latter village there is a reef with a depth of 3 feet (0^m9) over it. 50

Elpaputih baai.—Anchorages.—This bay, entered between Tandjung Latu, a low point situated on the northern side of the eastern entrance of Straat Ceram, and Tandjung Kuako, which lies about 14 miles east-north-eastward, is backed by mountainous land, which,

Charts 942a, 2759a, 1263.

Chart 3242.

on the western side, approaches the coast. Tandjung Kuako is the termination of a low tongue of land, covered with reeds, which is inconspicuous from westward, but about 2 miles south-south-eastward of it is Tandjung Ailusiha, a steep-to point, with a high clump of trees on it, which is well defined.

On the western side of the bay, situated about 9 miles north-north-eastward of Tandjung Latu, and about three-quarters of a mile inland, is Pohon Batu, 1,254 feet (382^m2) high, with a wide ridge, on the south-western side of which is a small distinctive tree. The only other noticeable summit farther northward is Hatu Mani, a table mountain, 2,137 feet (651^m4) high, which stands about 6½ miles northward of Pohon Batu. The head of the bay and the eastern side are bordered by a wide alluvial plain, covered with bamboo. On the eastern side, situated about 2 and 5 miles, respectively, eastward of Tandjung Kuako, are Kerai, 510 feet (155^m4) high, and Wele, 1,543 feet (470^m3) high, which can be identified on approaching from south-eastward.

There are a number of villages on the shores of the bay. Near Waija, on the northern shore, there is a shed with a zinc roof.

There are hot springs at many places around the bay; earth tremors frequently occur.

Anchorage may be obtained in Telok Meruru, situated close north-westward of Tandjung Latu, off the villages Makariki and Hururu, and in Baai van Amahai, on the eastern shore. During the North-west monsoon landing can usually be effected everywhere by praus.

Chart 930, plan of Baai van Amahai.

Baai van Amahai.—Dangers.—Light.—This bay is entered between Tandjung Kuako and Tandjung Umeputih, situated about one mile north-eastward. The limit of the roadstead is the parallel of Tandjung Kuako (*Lat. 3° 20' S., Long. 128° 55' E.*).

A reef, with depths of less than one fathom (1^m8) over it extends about half a mile from the eastern side of the bay. A safe anchorage may be obtained between this reef and the western shore, in depths of from 6 to 16 fathoms (11^m0 to 29^m3); during the North-west monsoon there are at times heavy squalls from northward in the afternoon, otherwise a vessel lies quietly here.

Kampung Amahai, at which there is a pier, with a depth of 1½ 2^m3 fathoms alongside, stands at the head of the bay; there is a flag-staff close southward of the pier.

A light is exhibited, at the root of the pier, which is in ruins.

Rainfall.—See page 27.

Chart 3242.

Coast.—About 2½ miles eastward of Tandjung Ailusiha, is Kampung Ruta, which is not visible from seaward, but close eastward of it there is a coconut plantation. About 6 miles east-north-eastward of Ruta, there is a hill, 660 feet (201^m2) high, on which there is an outstanding tree. There is a distinctive mosque at Kampung Sepa, situated on the coast 8 miles eastward of Ruta.

Between Tandjung Ailusiha and Tandjung Seitu, the low western entrance point of Taluti baai, which lies about 39 miles eastward, the land increases in height towards the latter point. As far eastward as Kampung Tamilau, situated 6 miles east-south-eastward of Sepa, the coast is clear of dangers, thence to Tandjung Seitu there are a number

Charts 942a, b, 2759a, 1263.

Chart 3242.

of detached shoals lying within one mile of the shore, including two sandbanks, Haumua and Pekelo, which nearly dry and which lie, respectively, about 15 and 21 miles eastward of Tandjung Tamila and about three-quarters of a mile and $1\frac{1}{4}$ miles offshore. 5

There is a heavy surf on this coast during the south-east monsoon, which, in conjunction with earth tremors, causes portions of foreshore to break away and fall into deep water.

Taluti baai, entered between Tandjung Seitu and Tandjung Mataia, situated about 25 miles eastward, is backed by mountainous land. 10
Waja, 2,590 feet (789^m4) high, is the highest part of the tongue of land which forms the western side of the bay. On the northern side is the Manusela gebergte, 6,796 feet (2071^m4) high, which forms the eastern spur of Binaija, 10,021 feet (3054^m4) high, the highest part of Ceram. The numerous lower peaks, northward of the eastern part of 15
Taluti baai, are difficult to distinguish from each other. Balimaklam, which stands $14\frac{1}{2}$ miles north-north-eastward of Tandjung Mataia, can, however, be identified as a sharp peak on a ridge of mountains. See also page 140.

The northern and eastern sides of Taluti baai are fringed by a narrow 20
reef, which widens somewhat at the mouth of the Wai Bobot, situated about 2 miles northward of Tandjung Mataia.

Anchorage may be obtained close offshore in several places, but during the South-east monsoon the coast is inaccessible except in 25
Rede Tehoru.

Chart 911, plan of Tehoru road.

Rede Tehoru.—Anchorage.—This roadstead is situated on the western side of Taluti baai, about $4\frac{1}{2}$ miles north-north-westward of Tandjung Seitu. The roadstead is very favourable, especially in the North-west monsoon, but less so during the South-east monsoon. 30
Drinking water can be obtained from a rivulet.

Anchorage may be obtained, in a depth of 11 fathoms (20^m1), sand and mud, with the flagstaff, which stands close to the beach at the western end of the village, bearing 140° , distant about $1\frac{1}{2}$ cables. A vessel can also anchor about one cable offshore, with a stern hawser to 35
the shore, with the mosque in the village bearing about 135° .

Chart 3242.

Coast.—Anchorage.—Between Tandjung Mataia (*Lat.* $3^\circ 25' S.$,



*Remarkable
hill*

Oson, bearing 328° , 26 miles.
(Original dated 1922.)

Long. $129^\circ 58' E.$) and Tandjung Undur, situated about 44 miles south-eastward, the only remarkable mountains are Watu Lus, 1,658 40
feet (505^m4) high, and cone shaped, which stands about 19 miles east-south-eastward of Tandjung Mataia, and Oson, 2,796 feet (852^m2) high with a double peak, about $2\frac{1}{2}$ miles north-north-eastward of Watu Lus.

A reef, with a depth of 10 feet (3^m0) over it, lies about half a mile offshore and $1\frac{1}{2}$ miles south-eastward of Tandjung Kisi, situated about 45

Charts 942b, 2759a, 1263.

Chart 3242.

12 miles south-eastward of Tandjung Mataia; and a reef, with a depth of 6 feet (1^m8) over it, lies about half a mile offshore about 3½ miles east-south-eastward of the same point.

5 *Chart 911, plan of Kisa Laut road.*

Good anchorage may be obtained in Rede Kisalaut, in a depth of about 9 fathoms (16^m5), sand, off Kampung Kisalaut, close northward of Tandjung Kisalaut, which lies about 12½ miles south-eastward of Tandjung Kisi. Tandjung Kisalaut is fringed by a reef about half

10 a cable wide.

Chart 3242.

Anchorage may be obtained by vessels with local knowledge, in depths of from 33 feet to 11 fathoms (10^m1 to 20^m1), mud, in Rede Kilmuri, situated about 2 miles north-westward of Tandjung Kilmuri; also about 10 miles east-south-eastward of Tandjung Kisalaut, between the coast and some reefs, with depths of from 5 to 13 feet (1^m5 to 4^m0) over them, lying about one mile off Kampung Selor.

15 Anchorage may be obtained by vessels with local knowledge, in depths of from 11 to 27 fathoms (20^m1 to 49^m4), off Kampung Undur, 20 situated close northward of Tandjung Undur, within the detached 23-foot (7^m0) reef which lies about 1½ miles north-westward of Tandjung Undur. About 1½ miles farther north-westward there is a 13-foot (4^m0) patch lying one mile offshore.

Between Tandjung Undur and Tandjung Aran, situated about 9½ 25 miles east-south-eastward, the coast is fringed by a drying reef, and detached shoals lie within 1½ miles of the coast, the positions of which may best be seen on the chart. Pulu Gofa, a low islet, covered with coconut trees, lies about one mile offshore and 2 miles west-south-westward of Tandjung Aran.

30 South-eastward of Tandjung Aran, the coast is fringed by a broad drying reef.

Eastward of Tandjung Undur there are several prominent peaks. Teri, 2,370 feet (722^m3) high, situated about 3 miles north-westward of Tandjung Aran, can be identified from a great distance, owing to its 35 steep dome shape with partly barren sides; it is the highest and westernmost of the fantastic mountainous land which occupies the south-eastern extremity of Ceram. (See view facing this page.) Approaching from westward this peak appears as a flat summit, and proceeding eastward the eastern side appears to be the highest. Suru, 40 also 2,370 feet (722^m3) high, which stands about 3½ miles east-north-eastward of Teri, is very steep on its northern side, but its western side has a gentler slope. Tunlean (*Lat.* 3° 47' S., *Long.* 130° 46' E.), 2,258 feet (688^m3) high, lies about one mile south-south-westward of Suru; both these mountains are distinctive, and except Teri, are covered 45 with vegetation.

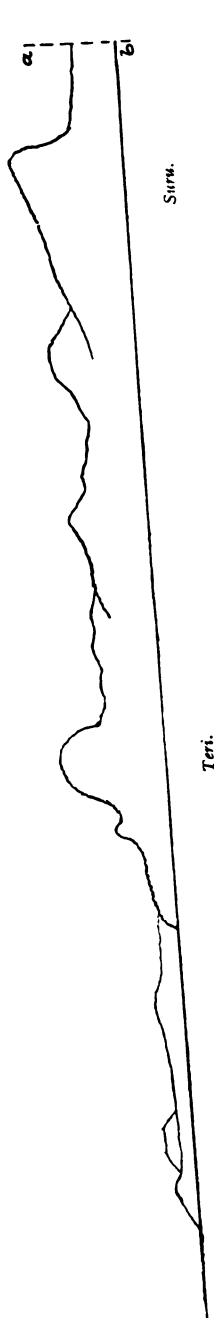
There are many villages on the coast, which are situated amongst extensive coconut plantations.

During the West monsoon anchorage may be obtained in most places, the reefs, which are marked by discoloration, can be seen from a short 50 distance.

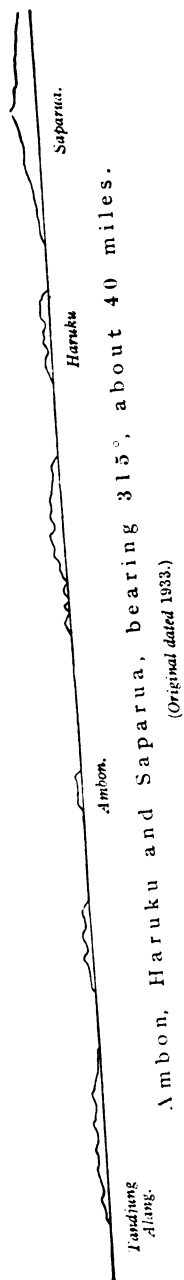
No tidal stream has been observed close offshore. Farther offshore the current due to the monsoon appears to be weaker than it is in the Banda sea.

Anchorage may be obtained by vessels with local knowledge, in

Charts 942b, 2759a, 1263.



View, in two parts, of the south-eastern extremity of Ceram.
(Original dated 1933.)



Ambon, Haruku and Saparua, bearing 315°, about 40 miles.
(Original dated 1933.)



↑
Tandjung Nusanive
bearing 281°, 7 miles.

South-eastern side of Ambon from eastward.
(Original dated 1933.)



↑
Tandjung Nusanive,
Along bearing 087°, 21 miles.

Ela. Halala. Lain.

South-western side of Ambon from westward.
(Original dated 1933.)



Saparua, bearing 000°.
(Original dated 1933.)

Chart 3242.

a depth of 11 fathoms (20^m1), eastward of Pulu Gofa. A vessel should approach the anchorage with Teri bearing 354°. Small vessels can anchor farther eastward, between Tandjung Aran and the 23-foot (7^m0) patches, lying about one mile southward, where there is some shelter 5 during the South-east monsoon.

Kampung Guli Guli, which stands on a point about 1½ miles south-eastward of Tandjung Aran, can be reached by praus through a channel in the drying coastal reef running in a north and south direction.

Charts 3241, 3242.

10

AMBON AND THE ULIASERS.—Ambon, and the three islands Haruku, Saparua and Nusa Laut, known as the Uliasers, lie southward of the western end of Ceram, being separated from it by Straat Ceram (page 145). They are inhabited by Christians. These islands are mountainous and earthquakes occur, although no volcanic eruptions 15 have been known; the most recent earthquake occurred in 1950, the previous one in 1898 caused great devastation in Ambon. See view facing page 148.

During the North-west monsoon sudden squalls are frequent; they also occur during the South-east monsoon, but are not so strong. 20

Ambon.—This island is divided into two parts by Baai van Ambon, the north-western part being Schiereiland Hitu and the south-eastern, Schiereiland Laitimor. The highest and most prominent mountain is Salahutu, 3,475 feet (1059^m2) high, from which several spurs radiate, the most outstanding of which is Setan, 1,850 feet (563^m9) high, 25 situated 2 miles north-westward, which appears conical from west-south-westward and the opposite direction, but is an excellent landmark, especially from northward. At the south-eastern extremity of the peninsula there are three remarkable flat-topped limestone mountains, of which Huwe, 1,205 feet (367^m3) high, is the highest. In 30 the western half of this peninsula there are many scattered peaks, but they are difficult to identify.

Charts 930, plan of Baai van Ambon, 3241, 3242.

Laitimor is highest on its south-eastern side, where Horiel attains an elevation of 1,904 feet (580^m3), its upper part is moderately flat 35 with small distinctive wood on it. Sirimau, 1,596 feet (486^m5) high, standing about one mile westward of Horiel, is a conical hill with a flat top. Suwal, 1,192 feet (363^m3) high, with a wood on its summit, situated 4 miles north-eastward of Tandjung Nusanive, the south-western extremity of Laitimor, can be easily identified from westward 40 and eastward.

Chart 3241.

Western and northern sides of Ambon.—Anchorages.—The western coast is in general more rocky than the northern coast, but both coasts are steep-to. Between Tandjung Alang (*Lat.* 3° 47' S., *Long.* 45 128° 00' E.), which lies about 6 miles westward of Tandjung Nusanive, and Tandjung Wairole, situated about 7½ miles north-westward, there is anchorage close offshore, in a depth of about 38 fathoms (69^m5), but strong tidal streams may be experienced, and there is no shelter in either monsoon. See views facing this page. 50

Nusa Telu, consisting of the high islets Lain, Hatala, and Ela, the last-named being 297 feet (90^m5) high, lie off Tandjung Wairole, and are good marks. They are separated from each other and from the

Charts 942a, 2769a, 1263.

Chart 3241.

coast by clear channels, but owing to the stream, which is sometimes strong, and the narrowness of the channels, these should not be used.

The northern coast, which is fringed by a narrow drying reef in 5 places, affords more opportunity for anchoring, although steep-to, and there may be a strong stream. A safe anchorage over a bottom of sand and stones may be obtained during both monsoons, close off Kampung Said, situated $8\frac{1}{2}$ miles north-eastward of Tandjung Wairole. The coastal reef eastward of Kampung Said is mostly marked by discoloration. 10 There is a mosque in Kampung Hitu Lama, situated about $5\frac{1}{2}$ miles eastward of Tandjung Hila, and also in Kampung Liang, on the northern coast.

Wai Loi, the largest river in Ambon, flows out about $3\frac{1}{2}$ miles eastward of Tandjung Hulung, which lies close westward of Kampung 15 Said; at high water it is about half a cable wide at its mouth.

Chart 930, plan of Baai van Ambon.

Baai van Ambon.—Light.—Baai van Ambon, entered between Tandjung Nusanive and Tandjung Alang, both of which are steep-to, has considerable depths, and is sheltered from both monsoons. Both 20 shores are steep-to.

A light is exhibited, at an elevation of 393 feet (119^m8), from a white iron framework structure, 69 feet (21^m0) in height, on Tandjung Nusanive (*Lat.* $3^{\circ} 47' S.$, *Long.* $128^{\circ} 05' E.$).

Chart 930, plan of Entrance to Inner Harbour.

25 At the head of the bay there is an inner harbour approached through a narrow channel, with a least depth of $4\frac{1}{2}$ fathoms (8^m7) over it.

Chart 930, plan of Reede Ambon.

Reede Ambon.—Lights.—Foul area.—Anchorage.—This roadstead, situated off the town of Ambon, on the south-eastern side of 30 Baai van Ambon, about $7\frac{1}{2}$ miles north-eastward of Tandjung Nusanive, affords anchorage for vessels not exceeding 245 feet (74^m7) in length, in a depth of about 25 fathoms (45^m7), off Fort Nieuw Victoria.

The limits of the roadstead are an imaginary line drawn in a 236° direction from Tandjung Batu Merah, about three-quarters of a mile 35 north-eastward of Fort Nieuw Victoria, and the meridian of $128^{\circ} 09' 35'' E.$

A foul area, due to the loss of an anchor and cable, lies about $3\frac{1}{2}$ cables north-north-eastward of the coaling wharf.

There is a concrete wharf abreast the town, with a quay, 328 feet 40 (100^m0) in length, with a depth alongside of 30 feet (9^m1). Abreast Fort Nieuw Victoria there are some old piles the heads of which only show at low water; care is necessary by boats when in the vicinity.

Lights, vertically disposed, are exhibited, from a flagstaff on the concrete wharf, for the use of vessels in the approaches; they indicate 45 the appropriate tidal signal; *see* below.

Digoel pier, 56 feet (17^m1) in length, with a depth of about $2\frac{1}{2}$ fathoms (4^m6) alongside, projects close southward of the concrete wharf; it is only suitable for small vessels.

The coaling wharf, situated about three-quarters of a mile south- 50 westward of the concrete wharf, is 275 feet (83^m8) in length, and has a least depth of 4 fathoms (7^m3) alongside. Vessels lie alongside quietly even when there is a considerable sea and swell in the bay.

Vessels berthing heading westward are advised to exercise caution as the shore reef projects considerably, eastward of the coaling wharf.

Charts 942a, 2759a 1263.

Chart 930, plan of Rede Ambon

When berthing at the concrete wharf during the north-west monsoon masters of vessels should have bow and stern anchors ready for dropping to prevent damage to vessels and wharf. A vessel must berth at this wharf with anchor and warp. 5

A pier, 492 feet (150^m0) in length, used by fishing craft, crosses the drying coastal bank about 4 cables eastward of the coaling wharf.

Signals.—The following tidal signals are shown from a flagstaff on the concrete wharf:—

- | | |
|--|--------------------|
| A white cone over a white drum, by day; at night,
a <i>white</i> light over a <i>red</i> light to indicate | In-coming tide. 10 |
| A white drum over an inverted white cone, by day;
at night, a <i>red</i> light over a <i>white</i> light to
indicate | Out-going tide. 15 |
| A white drum between a white cone and an inverted
white cone, by day; at night, a <i>white</i> light to
indicate | Slack water. |

Charts 930, plan of Baai van Ambon, 3241, 3242.

Tidal streams.—During the North-west monsoon there is usually a moderate westerly set off Tandjung Alang (*Lat.* 3° 47' S., *Long.* 20 128° 00' E.), which follows the coast and trends northward. There are sometimes eddies off Tandjung Nusanive. A strong stream may set along the south-east coast of Laitimor.

In the roadstead the streams set about north-east and south-west, the direction and rate, which seldom exceeds one knot, being dependent 25 on the wind. There is sometimes an eddy off the piers, so that the direction of the stream in the roadstead is not always an indication of what to expect when proceeding alongside.

Directions.—A vessel approaching Baai van Ambon in the rainy season, when the visibility is so much reduced, will find it difficult to 30 identify its features. If approaching from westward the high land in the vicinity of Tandjung Alang will first be distinguished. Coming from southward or just eastward of the meridian of Tandjung Nusanive, the light-green hill Kapal, 779 feet (237^m4) high, situated about 1½ miles north-eastward of this point, will appear as an islet in front of the 35 high land within the north-western shore of the bay.

It is recommended to approach the anchorage with the anchor lowered with from 25 to 30 fathoms (45^m7 to 54^m9) of cable out.

Chart 930, plan of Reede Ambon.

Landmarks.—A conspicuous mosque, with a cupola, stands about 40 2½ cables south-eastward of the concrete wharf, and there is another outstanding mosque in Kampung Batu Merah, situated about one mile north-eastward.

Harbour facilities.—Fresh provisions may be obtained. Fresh water is laid on to the concrete wharf and coaling wharf, it can be 45 supplied at the rate of 100 tons per day at the concrete wharf.

A large amount of coal is kept in stock, and an ample quantity of fuel oil.

A medical officer resides in the town, in which there is a hospital.

Radio.—There is a radio station. See page 5. 50

Trade.—The principal exports are cloves, nutmegs, mace and copra; the chief imports are cloth, ironware, canned provisions and timber.

Climatic tables.—See page 33.

Charts 942a, 2759a, 1263.

Chart 3242.

South-eastern side of Ambon.—Anchorage.—During the South-east monsoon this coast is almost inaccessible. Baai van Seri, entered between Tandjung Hatiari (*Lat. 3° 46' S., Long. 128° 09' E.*), which lies 5 4 miles north-eastward of Tandjung Nusanive, and Tandjung Seri, situated about 1½ miles north-north-eastward of Tandjung Hatiari, affords anchorage to vessels with local knowledge, in depths of from 15 to 16 feet (4^m6 to 4^m9), on the detached bank which runs parallel to the shore northward of Tandjung Hatiari; the channel between this 10 bank and the shore is only accessible from northward.

Tandjung Riki, which lies about 6½ miles north-eastward of Tandjung Seri, is rendered distinctive by some bare rocks. At Kampung Laehari, situated close north-westward of Tandjung Riki, the trees stand as far as 2 cables out in the sea at high water, but the village is 15 not visible from seaward. In the bight entered between Tandjung Riki and Tandjung Hutumuri, which lies about 1½ miles north-eastward, there are a few villages. There is an outstanding house with a light-coloured roof in Kampung Hutumuri, situated on the northern shore of this bight.

20 Baai van Baguala is entered between Tandjung Hutumuri and Tandjung Meriam, which lies about 5 miles north-eastward; it is shallow at its head.

A shoal with a rock near its centre with a depth of 7 feet (2^m1) over it, lies in the middle of the entrance to the bay. A shoal, with a depth 25 of 23 feet (7^m0) over it, lies about 2 miles westward of Tandjung Meriam and half a mile offshore. A detached 13-foot (4^m0) patch lies off the south-eastern extremity of the shore bank at the head of the bay, about 3 cables off the south-western shore.

Straate Haruku.—Anchorage.—Straat Haruku, which lies between the eastern side of Ambon and Haruku, has a least width of 30 about 2½ miles, but the navigable channel is reduced to a width of about 1½ miles at the northern end between a drying reef on which Pombo, a low islet, lies and a detached reef about 1½ miles east-north-eastward of it. Batu Lompa and Batu Dua, lying close off the 35 western shore, about 2½ and 5½ miles, respectively, northward of Tandjung Meriam, are rocks above water, and are good marks. Batu Kapal, thickly covered with vegetation, lies close off Tandjung Batu Kapal, the south-western extremity of Haruku, and is prominent. The trees standing on the mountain, 1,090 feet (332^m2) high, situated 40 about 3½ miles north-north-eastward of Tandjung Batu Kapal, and the white tower of a mosque in Kampung Kailolo, situated about 3 miles farther northward, are good landmarks.

The eastern shore is not so clear as the western, especially northward of Tandjung Totu, where there are some detached dangers.

45 The only anchorage on the western side of the strait is off Kampung Waai, which is difficult to identify. There are two dark green points in this vicinity, and the village stands south-westward of the south-western one; there is a boat shed on the beach, from which a flag is usually displayed on the arrival of a vessel. Anchorage may be 50 obtained, in a depth of about 21 fathoms (38^m4), with the boat shed bearing 263° and Pombo, 058°.

Anchorage may be obtained during both monsoons by vessels with local knowledge, off the villages of Haruku and Kabau, situated on the eastern side of the strait. The anchorage off Haruku (*Lat. 3°*

Charts 942a, 2759a, 1263.

Chart 3242.

36' S., Long. 128° 25' E.) is in a depth of about 27 fathoms (49^m4), with the high roof of the church in it bearing 100°. Off Kabau, where three mosques stand close together, a vessel can obtain anchorage off the edge of the detached reef, which fronts the village, in a depth of about 27 fathoms (49^m4), with the southern mosque, which is the least evident, bearing 101°.

A vessel proceeding through the strait at night should keep to the western side. The tidal streams set northward and southward, at a maximum rate of 1½ knots. They are strongest off Tandjung Batu Kapal, where tide-rips occur, and on both sides of Pombo.

Haruku.—Anchorages.—The summit of this island, Huruano, 1,970 feet (600^m4) high, is a good mark from between east and south-east, from which direction it has a rounded shape, but from between north-west and north it appears conical. The central mountain group extends to the south coast, where it terminates steeply on the eastern side of Telok Aboru, situated about 6 miles eastward of Tandjung Batu Kapal. There are two prominent conical hills on Tandjung Waisoi Besar, on the southern side of the island. Farther westward the mountainous land extends to a high plateau, which terminates in Tandjung Batu Itam and Tandjung Batu Kapal at the south-western extremity of the island. (Lat. 3° 38' S., Long. 128° 24' E.).

Anchorage may be obtained off all the villages on the coast of Haruku. In Telok Aboru, the best berth is with a house with a white wall in Kampung Aboru bearing 332°; this anchorage is unsafe in the South-east monsoon. Off Kampung Pulauw, situated near the middle of the northern coast, there are depths of from 27 to 33 fathoms (49^m4 to 60^m4), outside the influence of the stream, with the mosque in line with Huruano, bearing 159°.



Huruano in line with mosque, bearing 159°. (Original dated 1933.)

Straat Sapparua.—Anchorages.—This strait, between Haruku and Sapparua, which lies eastward of it, has a least width of half a mile and is clear of dangers in the fairway. The reefs which extend from either side in the narrow part of the strait are usually well marked by discoloration.

Molana, an uninhabited island 575 feet (175^m3) high, and steep-to, lies in the southern approach to the strait with its northern extremity about 2½ miles westward of Tandjung Booi (Bui), the southern extremity of Sapparua.

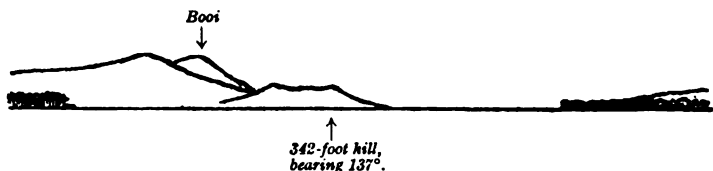
A temporary anchorage may be obtained by vessels with local knowledge, in a depth of about 15 fathoms (27^m4), off Kampung Hulaliu, situated on the western side of the strait close southward of Tandjung Haluamuna, the north-eastern point of Haruku. Anchorage may be

Charts 942a, 2759a, 1263.

Chart 3242.

obtained in Baai van Haria, on the eastern side of the strait at its southern end, but there may be some sea during the North-west monsoon.

- 5 A vessel approaching the strait from northward should steer for the 342-foot (104^m2) hill, which stands close southward of Tandjung Hatualane (*Lat.* 3° 35' S., *Long.* 128° 37' E.), the southern entrance point of Baai van Haria, bearing 137°, taking care to keep in the middle of the strait. Vessels are recommended not to use this passage at night.



Straat Sapparua from north-westward.

(Original dated 1933.)

- 10 The tidal streams set north-west and south-east, and may attain a rate of 3 knots. Tide-rips occur north-westward of the narrowest part of the strait.

Saparua.—Anchorage.—This island is mountainous with a distinctive depression in its narrowest part. Tahuku, its summit, which stands about midway on the western side, is 1,179 feet (359^m4) high; Booi, 1,061 feet (323^m4) high, close within Tandjung Booi, is very prominent. Along the shores of Baai van Tuhaha, situated on the northern side, the land is flat, elsewhere the coast is mostly rocky. See view facing page 149.

- 20 There is an extensive detached reef with two drying patches on the western side of Baai van Tuhaha; a reef extends about 4 cables from the northern part of the western shore and as much as 2½ cables from the middle of the eastern shore.

Good anchorage may be obtained in Baai van Tuhaha, the best berth being southward of Kampung Nolot, situated on Tandjung Nolot, the eastern entrance point of the bay. Farther northward there is inconvenience from the strong stream, which is constantly changing its direction.

- On the southern side of Saparua there is a bay entered between Tandjung Booi and Tandjung Ouw, situated about 4½ miles eastward. Close eastward of Tandjung Booi is Pombo, a rocky islet, 47 feet (14^m3) high, covered with vegetation. Tandjung Ouw rises steeply from the sea to an elevation of 162 feet (49^m4). Reefs, which dry, extend from both entrance points, and a strong stream sets along the reefs.

- 35 The western side of the bay is steep, with a narrow shore reef. The south-eastern side is also steep, but there is a wide shore reef, with a 17-foot (5^m2) patch lying about half a mile off, about 2½ miles north-westward of Tandjung Ouw.

Chart 911, plan of Saparua bay.

- 40 **Rede Sapparua.—Light.—Beacon.**—This roadstead lies northward of an imaginary line drawn from Tandjung Paperu, which lies about 2½ miles north-north-eastward of Tandjung Booi, to Tandjung Torano, situated about 1½ miles east-north-eastward of Tandjung Paperu.

Charts 942a, b, 2759a, 1263.

Chart 911, plan of Saparua bay

A reef, with a depth of $1\frac{1}{2}$ fathoms (2^m3) over it, marked on its northern side by a beacon, lies 6 cables north-westward of Tandjung Paperu.

Kampung Saparua is situated at the head of the bay. There is a pier 5 with a depth of about one foot (0^m3) alongside.

A light is exhibited, at an elevation of 17 feet (5^m2), from a wooden post, 16 feet (4^m9) in height, on the head of the pier at Saparua.

A white monument, which stands on the shore about $3\frac{1}{2}$ cables westward of the pier-head, is a good mark. 10

The roadstead is calm, except occasionally during the South-east monsoon, when there may be some swell, although not sufficient to prevent communication with the shore. A vessel entering the roadstead should steer for the pier-head, bearing 320° , which will lead clear of the $1\frac{1}{2}$ fathom (2^m3) reef north-westward of Tandjung Paperu 15 (Lat. $3^\circ 35' S.$, Long. $128^\circ 40' E.$).

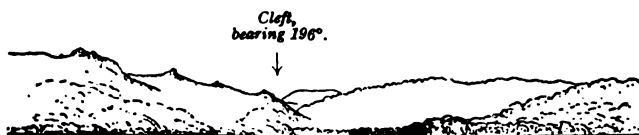
Saparua is the capital of Saparua province. There is a port doctor.

Rainfall.—See page 27.

Chart 3242.

Nusa Laut.—Anchorage.—Nusa Laut, situated about $2\frac{1}{2}$ miles 20 south-eastward of the south-eastern extremity of Saparua, is fringed by a reef, which mostly dries. Lawakano, its commanding summit, is 1,113 feet (339^m3) high.

A vessel proceeding through the channel between Saparua and Nusa Laut, should give the former a berth of at least $3\frac{1}{2}$ cables, and 25 the latter at least $5\frac{1}{2}$ cables.



Baai van Nalahia from north-north-eastward.

(Original dated 1933.)

Chart 911, plan of Nalahia bay.

Baai van Nalahia, situated on the northern side of Nusa Laut, is backed by steep hills and can be easily identified from seaward. A vessel should approach with a cleft in the hills bearing 196° , and 30 anchor when a depth of about 36 fathoms (65^m8) is obtained, abreast the point on the western side, about 130 feet (39^m6) high, on which Kampung Nalahia (Lat. $3^\circ 39' S.$, Long. $128^\circ 47' E.$) stands. Vessels lie here quietly during both monsoons.

Charts 942a, b, 2759a, 1263.

CHAPTER IV

BANDA AND ARAFURA SEAS

Charts 942a, b.

BANDA SEA.—The limits of the Banda sea are as follows:—

On the north.—The southern limits of the Molukka and Ceram seas.

On the east.—From Tandjung Borang, the northern point of Nuhu
5 Tjut, Kai eilanden, through this island to Tandjung Weduar, its
southern point, thence a line to the north-eastern point of Fordate,
through this island and across to the north-eastern point of Larat
(*Lat. 7° 06' S., Long. 131° 55' E.*), Tanimbar eilanden, down the east
coast of Jamdena to its southern point, thence through Anggarmasa in
10 Straat Egeron to the northern point of Selaru and through this island to
Tandjung Aro Usu (*Lat. 8° 21' S., Long. 130° 45' E.*) its south-western
point.

On the south.—From Tandjung Aro Usu through Sermata to Tand-
jung Njadora, the south-eastern point of Lakor (*Lat. 8° 16' S., Long.*
15 *128° 14' E.*), along the southern coasts of the islands Lakor, Moa and
Lèti to Tandjung Tut Peteh, the western point of Lati, thence to
Tandjung Sewirawa, the eastern extremity of Timor and along the
northern coast as far as the meridian 125° E.

On the west.—From the northern coast of Timor up the meridian
20 125° E. to the island Alor, thence around the eastern point and along
the northern coasts of the islands Alor, Pantar, Lomblen and Adunera
across the northern end of Straat Flores to Tandjung Serbeti, the
eastern extremity of Flores, thence from Tandjung Kopondai, its
northern point (*Lat. 8° 04' S., Long. 122° 52' E.*), to Kalao Toa eiland
25 (*Lat. 7° 24' S., Long. 121° 52' E.*), and through the chain of islands lying
between it and the southern point of Pulu Saleier, through this island
and across Straat Saleier to Tandjung Lassa, the southern point of
Celebes (*Lat. 5° 37' S., Long. 120° 28' E.*) thence along the southern
limit of Golf Van Boni and up the east coast of Celebes to Tandjung
30 Botok (*Lat. 1° 04' S., Long. 123° 19' E.*).

N.B. The whole of the western limit of the Banda sea lies in the
area covered by Eastern Archipelago Pilot, Vol. II.

Current.—See page 19.

Chart 3239.

35 **Outlying dangers.**—A shoal, the position of which is doubtful,
was reported, in 1927, to lie about 36 miles south-westward of the
southern extremity of Buru. A shoal, the position of which is approx-
imate, was reported, in 1950, to lie about 23 miles west-south-westward
of the same point. See also page 129. These are the only known
40 dangers in Banda sea, except those in the vicinity of the various
islands, which are described with those islands.

Charts 2759a, 1263.

Chart 3239.

Lucipara eilanden.—This uninhabited group, situated 108 miles south-south-eastward of the southern extremity of Buru, consists of four coral islands, namely, Mai, Laponda, Kaurangka and Selatan, lying on an extensive reef, the edge of which dries and is steep-to. 5 They are covered with vegetation, and the tops of the trees on Mai, the north-westernmost island, are 106 feet (32^m3) high. Landing can be effected on the lee side if the sea is not too heavy.

Skaro rif (*Lat. 5° 35' S., Long. 127° 29' E.*), which dries, lies about 6 miles south-westward of Lucipara eilanden; on the reef are two 10 white sandy patches which only cover at the highest half yearly water levels. There is a clear deep channel between the islands and the reef.

Irregular tidal streams and eddies have been observed close southward and north-westward of Lucipara eilanden.

Schildpad eilanden.—This uninhabited group, situated about 15 14 miles north-eastward of Lucipara eilanden, consists of three low coral islands, namely, Mai, Kadola and Bingkudu. They are covered with high trees, and lie on detached reefs which dry and are steep-to. The channels between them are deep and clear of dangers.

Chart 3243.

20

Eiland Manuk.—**Anchorage.**—This island (*Lat. 5° 33' S., Long. 130° 18' E.*) situated about 150 miles eastward of Schildpad eilanden, rises steeply in the form of a truncated cone to an elevation of 932 feet (284^m1); it is volcanic but no eruptions have been known; the crater, which shows best from the south-south-eastern side, is in the centre of 25 the island. On the western side of the island there is a small sandy beach, behind which the mountain rises vertically. In 1899, dense vapour was seen issuing from the crater wall, and quantities of sulphur were found on the island. The coastal reef which dries, extends about one cable offshore at the north-western extremity and as far southward 30 as the sandy beach.

Anchorage may be obtained by a small craft, in calm weather, in the transition period of the monsoons, in a depth of about 44 fathoms (80^m5), about 1½ cables from the sandy beach.

BANDA EILANDEN.—**Tidal streams.**—These islands, situated 35 about 65 miles south-westward of the south-eastern extremity of Ceram, are divided into the main group, comprising Groot Banda, Naira, and Gunung Api, and the outer islands, namely, Suanggi, Run, Ai and Rozengain. See views facing page 162. The depths around the islands are considerable, and the only off-lying danger is Rif van Rozengain 40 (page 160). Earthquakes frequently occur, and destructive volcanic eruptions have taken place, the latest, in 1852. All the islands, except Suanggi, are inhabited.

In June and September, the sea for many miles around the islands assumes a whitish appearance as if a thin mist was hanging over the 45 surface, which is attributed to a mass of small animalcules, which float in the water near the surface.

In the narrow channels of the main group the tidal streams are strong; tide-rips occur between the outer islands and the main group, and between Rozengain and Rif van Rozengain they sometimes give 50 the impression of breakers.

Suanggi.—This island (*Lat. 4° 19' S., Long. 129° 42' E.*), the northernmost of the group, is 348 feet (106^m1) high, with almost

Chart 942b, 2759a, 1263.

Chart 3243.

vertical bare sides and the summit covered with vegetation. The island is fringed by a drying reef except on its western side.



Suanggi, bearing 056°, 6 miles.

(Original dated 1933.)

Run.—Anchorage.—This island, the westernmost of the group, is 5 663 feet (202^m1) high at its southern end, and steep. It is fringed by a reef, which dries, and which extends about three-quarters of a mile north-north-eastward from the northern extremity of the island. Nailaka is a low islet lying on this part of the reef.

The only anchorage is in the bight in the drying reef between Nailaka 10 and Tandjung Lokon, the eastern extremity of the island, in a depth of 38 fathoms (69^m5), but it is only of use in the West monsoon.

Ai.—Anchorage.—This island which lies about 4½ miles east-north-eastward of Run, is 473 feet (144^m2) high on its eastern side, and is generally steep except on its northern side; the north-eastern and 15 north-western extremities are high. The island is entirely fringed by a drying reef. In the western part of Kampung Ai, situated on the northern side of the island, there is an old fort.

There is a restricted anchorage for large vessels, in a depth of 38 fathoms (69^m5), sand and stones, off the western side of the island, 20 with Tandjung Batu Pajong, the north-western extremity, bearing 060°, and Tandjung Batu Udang, 128°.

Chart 3440, plan of Banda islands.

Groot Banda.—This island has a ridge of hills, covered with vegetation, running through its entire length, of which, Bandera, 25 1,757 feet (535^m5) high, is the summit. Except at the western end on the northern side of the island, there is little or no fringing reef. Most of the villages are on the northern side. Lontor, near the western end of the island, stands on the slope of an old crater wall.

About 6 cables north-north-westward of Tandjung Burang, the 30 northern extremity of Groot Banda, is Pisang, an islet 213 feet (64^m9) high, on which there is a coconut plantation, and a distinctive bare rock on its northern extremity. Batu Kapal, a bare islet, lies about 3 cables farther northward. It is inadvisable to attempt the passage between these islets, as the tidal streams are strong, but Gat van 35 Selamo, the passage between Tandjung Burang and Pisang, is deep and clear of dangers, and a vessel may round the point closely.

Oostgat, the wide channel between Pisang and Naira, is deep and clear, *Chart 3440, plans of Banda islands, and Naira road.*

Naira.—Naira is hilly; Papenberg (*Lat.* 4° 31' S., *Long.* 129° 54' E.), 40 the summit, is 819 feet (249^m6) high. The northern, eastern and southern sides of the island are fringed by a drying reef, which extends as much as 1½ cables offshore in places.

At the northern end of Zonnegat, which separates Naira from Gunung Api, is Kraka, an islet, 84 feet (25^m6) high.

45 Reden Banda comprises two roadsteads, one situated in the southern part of Zonnegat, and the other southward of Naira.

Charts 3243, 942b, 2759a, 1263.

Chart 3440, plan of Banda islands and Naira road

Gunung Api.—Gunung Api is almost entirely occupied by the volcano Vuurberg, 2,150 feet (655^m3) high; its upper part is bare, and vapour issues from the two craters which are on the sides of the summit; sulphurous fumes are also emitted from crevices elsewhere. At the north-eastern extremity of the island is Uluweru, a hill 307 feet (93^m6) high, which has steep sides. Only on the western side of the island is there no drying reef. 5

Tidal streams.—Strong tidal streams set through the channels. In the roadstead southward of Naira, the stream sets eastward during the rising tide, and westward with the falling tide, at a maximum rate of 3 knots. 10

Chart 3440, plan of Naira road.

Anchorage.—**Directions.**—Good anchorage may be obtained, over sand, coral and stones, in any required depth, southward of Naira. 15

The depths in Zonnegat are considerable, and squalls are frequent.

A vessel of moderate size bound for the roadstead in Zonnegat, should approach from northward, and may pass on either side of Kraka; if passing south-westward of it she should steer for the village on the western side of Naira, situated about 1½ cables southward of Papenberg, bearing 121°, open north-eastward of Pulu Vera, which leads over the bar south-westward of Kraka in a least depth of 6½ fathoms (11^m9); the bank which fringes the northern side of Gunung Api is mostly marked by discoloration. If passing eastward of Kraka she should keep the eastern side of the Government pier (see below) in line with the eastern side of Pulu Vera, bearing about 163°. (*Lat. 4° 31' S., Long. 129° 53' E.*) 20 25

A vessel from westward proceeding through Gat van Lontor, the channel between the southern side of Gunung Api and the northern side of the western end of Groot Banda, should keep close to Gunung Api until abeam of Verbrande hoek, situated in the middle of the southern side of Gunung Api. There is a least depth in the fairway of 26 feet (7^m9). 30

Piers.—**Lights.**—**Town.**—There are two piers, which dry alongside on the southern side of Naira, the western, on which there is a shed, being the better. 35

A light is occasionally exhibited, at an elevation of 7 feet (2^m1), from a wooden post, at the head of the eastern pier.

Two lights are occasionally exhibited at the head of the western pier.

The Government pier is situated in Zonnegat, on the south-western side of Naira, and has depths of from 15 to 26 feet (4^m6 to 7^m9) along-side. There is a mooring buoy westward of the pier. Vessels should moor alongside heading northward, with an anchor ahead and a hawser laid out to the mooring buoy. 40

The town of Naira stands along the south-western and southern sides of the island of Naira; the western part is occupied by Chinese, and the eastern part by Europeans. 45

Provisions and fresh water are scarce. There is a medical officer in the town.

Rainfall.—See page 27. 50

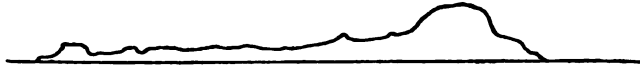
Chart 3243.

Rozengain.—This island lies about 5 miles south-eastward of Groot Banda. Lari, the summit, is 558 feet (170^m1) high, and is covered with vegetation. Kota Batu Merah, a bare hill, 555 feet (169^m2)

Charts 2759a, 1263, 942b.

Chart 3243.

high, situated on the eastern side of the island, is prominent; a small wood stands on its western slope near the summit, and is especially noticeable from southward. The island is fringed by a drying reef marked by discoloration, except on its south-western side. Two rocks, above water, lie one on either side of Tandjung Pulu (*Lat. 4° 34' S., Long. 130° 02' E.*), the north-eastern extremity of the island. Rozengain, the only village, stands near a small sandy beach on the northern side of the island.



Rozengain, bearing 000°, 7 miles.

(Original dated 1933.)

- 10 **Off-lying danger.**—Rif van Rozengain, situated about 2 miles south-south-eastward of Rozengain, dries about 3 feet (0^m9) at its northern end; it is marked by discoloration and the sea breaks heavily on this reef.

Chart 3242.

- 15 **ISLANDS OFF SOUTH-EASTERN END OF CERAM.**—A ridge, with depths of less than 100 fathoms (182^m9) over it, on which there are a number of islets and drying reefs, extends about 22 miles eastward from the south-eastern extremity of Ceram. Between these reefs there are four channels, leading northward from Banda sea, of which the two western, Straat Kefing and Straat Kilwaru are the most important. The easternmost channel is obstructed on its northern side by a barrier of reefs. The edges of the reefs on all sides of this channel are marked by bright discoloration, and there are often heavy breakers on them.
- 20 Ceram Laut and the islets westward are described with Straat Kilwaru and Straat Kefing. See below.

- Marlau, which is low, lies close eastward of the north-eastern extremity of Ceram Laut, to which it is connected at low water. Small vessels find good anchorage in the bight of the reef northward of
- 30 Marlau. Kifar, 129 feet (39^m3) high, situated about 2 miles south-eastward of Marlau, and several low islets lying on the drying reefs farther eastward, are all covered with coconut trees. A tree stands on a rock situated about 6 cables south-south-westward of Kifar. Some of these islets are inhabited.

- 35 **Tidal streams.**—Tidal streams, attaining a rate of 3 knots at springs, set through the channels mentioned above, and when they are opposed to the wind there is often a rough sea. The stream usually sets northward with the rising tide and southward with the falling tide. At Geser, however, at springs, the south-going stream commences 2 hours after high water, and at neaps about one hour after high water.

- Eastward and southward of Koon, an island situated at the eastern extremity of the ridge mentioned above, the tidal streams are strong and variable, and cause heavy tide-rips in this vicinity and also off the northern end of Gorong eilanden (page 162). In the passage between Koon and Pandjang the stream sets strongly towards the ridge extending eastward from Ceram.

Charts 942b, 2759a, 1263.

Chart 3440, plan of Kilwaru and Kefing straits.

Straat Kefing.—Dangers.—This strait, lying between Ceram Rei (Serang Rei) and Geser, is about 8 cables wide between the drying reefs on either side, and is deep in the fairway.

Ceram Rei (*Lat. 3° 52' S., Long. 130° 51' E.*) is a low islet covered with high trees, lying on the north-eastern edge of the drying reef, which extends about $1\frac{1}{2}$ miles south-eastward from the south-eastern extremity of Ceram. It is fringed by a white sandy beach which covers at high water. There are a number of trees on the drying reef between the islet and the coast of Ceram. This reef, and also the islet on this side, are extending. 5 10

Geser, a flat islet, wooded with high trees, lies on the north-eastern side of a drying reef, situated about $1\frac{1}{2}$ miles east-south-eastward of Ceram Rei.

Straat Kefing is marked on its eastern side by stakes, each surmounted by a ball, standing on the edge of the reef on which Geser lies. There is a shoal, with a depth of 29 feet (8^m8) over it, on the western side of the southern entrance, situated about $1\frac{1}{4}$ miles southward of the south-eastern extremity of Ceram Rei, and a shoal, with a depth of 23 feet (7^m0) over it, lies on the eastern side about 9 cables south-westward of the southern extremity of Geser. 15 20

Straat Kilwaru.—Light.—Beacons.—This strait, between Geser and the western side of Ceram Laut (Serang Laut), has a least depth of 6 fathoms (11^m0) in the fairway between the reefs on either side. Ceram Laut is 293 feet (89^m3) high, rocky, and mostly covered with coconut trees. Kilwaru, situated about half a mile eastward of the northern end of Geser, is low. 25

A light is occasionally exhibited, at an elevation of 30 feet (9^m1), from a mast on the pier-head on the north-eastern side of Geser.

The fairway is marked by beacons. The edge of the reef on either side is also marked by several unofficial beacons, the positions of which may best be seen on the plan. The beacons on the western side of the channel are painted black and those on the eastern side white. 30

The direction of the tidal stream is sometimes indicated from the flagstaff on the pier by a red flag, indicating a north-going stream, a white flag, slack water, and a blue flag, a south-going stream. 35

Rede Geser.—The limits of the roadstead are the parallels of 3° 52' 20" S and 3° 53' 10" S. The pier is situated on the northern side of the entrance to a lagoon. Kampung Geser stands on both sides of the entrance to the lagoon, the two parts being connected by a bridge. The village is the headquarters of a Government official. Forest produce and copra are exported. Provisions, except fish, are very scarce. 40

There is a stone mole, 246 feet (75^m0) in length, with a shed on it, on the northern side of Geser.

Anchorage.—Directions.—The best berth is about one cable off shore abreast the pier, in a depth of about 10 fathoms (18^m3), pebbles; it is advisable to moor as the anchorage is confined. If the tidal stream is strong and the sea rough, it is advisable to anchor farther northward, north-eastward of the black truncated cone beacon, situated on the edge of the reef about 4 cables north-north-westward of the light-structure. 45 50

Vessels should approach the roadstead against the tidal stream.

A vessel approaching from southward should steer for the prominent summit (chart 3242) of Ceram Laut, bearing 056°, until Kilwaru

Charts 942b, 2759a, 1263.

Chart 3440, plan of Kilwaru and Kefing straits.

(*Lat. 3° 53' S., Long. 130° 54' E.*), is bearing about 020°, when she should alter course northward and be guided by the beacons to the anchorage.

A vessel approaching from northward should steer for the northern entrance of Straat Kefing until the north-eastern extremity of Geser is in line with the south-western extremity of Ceram Laut, bearing about 158°, when the beacons will be sighted and the vessel can proceed to the anchorage.

The beacon with a black-truncated cone, which stands at the north-eastern extremity of the reef extending northward from Geser is very difficult to see when approaching from eastward.

Chart 3232.

The channel which lies about one mile eastward of Ceram Laut has a least depth of 6½ fathoms (11^m4) near its northern end, and a least width of about 4 cables; it is unmarked.

Chart 3243.

Gorong eilanden.—This group consists of Pandjang, Manawoka and Gorong, all thickly covered with vegetation. *See* view facing page 164. Pandjang, which lies about 16 miles east-south-eastward of Ceram Laut, is 326 feet (99^m4) high. The most outstanding landmark of the group is Lololi, the summit of Manawoka, which attains an elevation of 1,176 feet (358^m5), and appears as a table mountain from south-westward, but from northward or southward appears as a peak. Gorong, which lies about 7½ miles eastward of Pandjang, is 1,051 feet (320^m3) high at the summit, Watu Keliang, situated near the middle. From eastward, a small clump of trees, the top of which has an elevation of 910 feet (277^m3), projects above the remaining thick vegetation.

Each island is fringed by a steep-to coral reef, and there are no off-lying dangers more than one mile offshore. The channels between the islands are deep.

Pandjang is rocky on its southern and south-western sides, but is interspersed with small sandy beaches. For about 1½ miles northward of Kampung Wisalen, which stands on the south-eastern side of the island, the coast is bordered by mangroves, off which clumps of trees stand in many places on the coastal reef. The whole island is densely wooded.

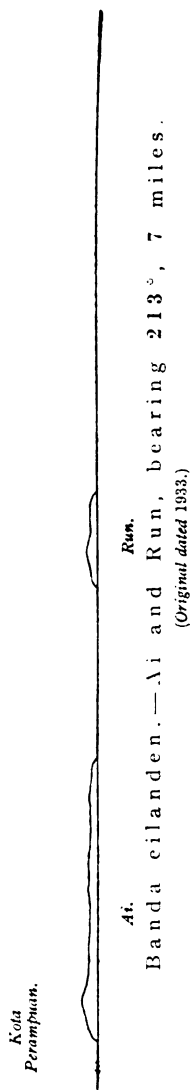
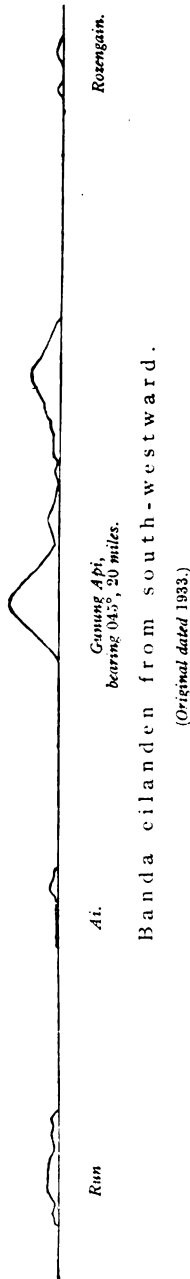
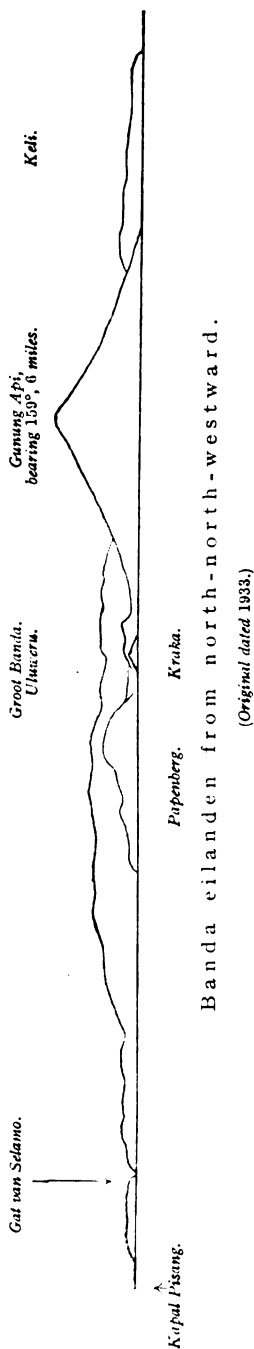
Manawoka lies about 2 miles south-eastward of Pandjang; its coast is alternately low and rocky. There are a few villages on the east coast with large coconut plantations.

The coast of Gorong is mostly low and there are numerous coconut plantations along it. Tandjung Assan, the north-western extremity, is rocky, and Tandjung Namalèn (*chart 3242*), the north-eastern extremity, is sandy.

Tidal streams.—The tidal streams in the vicinity of Gorong eilanden set northward with the rising tide and southward with the falling tide. Southward of Manawoka the latter stream sets about south-south-westward at a rate of 2½ knots at springs. There are strong tide-rips in places, especially off the southern ends of the islands.

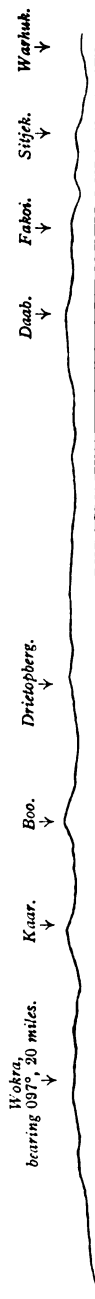
Anchorages.—Anchorage may be obtained, in a depth of 39 feet (11^m9), near, or on the small bank which lies northward of Kampung Amar (*Lat. 4° 05' S., Long. 131° 19' E.*), situated on the north-eastern side of Manawoka, about 2 miles from the northern end of the island. Vessels, however, do not lie quietly here during the strength of the

Charts 942b, 2759a, 1263.





Kai eilanden.—Southern extremity of Kaimeer, bearing 062° , 8 miles.
(Original dated 1933.)



Kai eilanden.—Northern end of Nuhu Tjut from westward.
(Original dated 1933.)

Chart 3243.

monsoons, and landing is difficult in the northerly monsoon. The village and flagstaff are not easily identified but a flag is usually hoisted when a vessel is approaching. Some large rocks, which only cover at very high water, lie on the edge of the drying reef eastward of the flagstaff. There is a channel, which dries, in the reef there, in which praus often lie. 5

Anchorage may be obtained by vessels with local knowledge in Rede Ondur, which lies on the western side of Gorong, about 2 miles southward of Tandjung Assan. There is a channel, marked by unofficial beacons, leading to the anchorage. A reef, with a depth of 13 feet (4^m0) over it, lies on the northern side of the entrance to the channel, about 6½ cables south-westward of the mosque in Kampung Ondur. Large vessels should anchor, in a depth of 22 fathoms (40^m2), in the outer basin. 15

Anchorage may be obtained by vessels with local knowledge in Rede Kailakat, which lies on the eastern side of Gorong near the southern end. The small bay here can be easily identified by a noticeable bare patch situated close southward of the southern entrance point. A vessel should approach with the white bridge spanning the river 20 mouth, situated southward of the southernmost mosque, bearing 265°. A drying reef extends as much as 2½ cables offshore on both sides of the bay.

Watubela eilanden.—This group, which lies south-south-eastward of Gorong eilanden, consists of the hilly islands Ingar, Watubela, 25 Kasiui, Kurkap, Baäm, Tioor, Uran, and all of which are thickly covered with vegetation. See views facing page 164 and page 165. The channels between the islands are clear of dangers in the fairway. The inhabitants are friendly, but idle. Copra culture and fishing are their principal means of existence, but there is little trade. 30

Ingar, situated about 14 miles south-eastward of Manawoka, is a low island covered with coconut trees, and is bordered by a white beach. The island is uninhabited.

Watubela lies 2½ miles south-south-eastward of Ingar. Dadang, its summit, 702 feet (214^m0) high, is distinctive from eastward and 35 westward.

Kasiui is separated from Watubela by Straat Horot Lomi, which is not recommended on account of the strong tidal streams which are accompanied by heavy tide-rips; the fairway is narrowed to a width of about 1½ cables by a reef which extends from the southern 40 side of Watubela. The summit, which is 1,152 feet (351^m1) high, is fairly prominent. The greater part of the east coast is fringed by a drying reef, which extends as much as half a mile offshore, and the edge of which is steep-to. There are several villages on this coast and one on the west coast. 45

Kurkap (*Lat. 4° 33' S., Long. 131° 47' E.*), situated about 6½ miles eastward of the southern extremity of Kasiui, is 112 feet (34^m1) high; it is fringed by a reef, which dries, and a detached reef, which dries, lies about half a mile eastward of it. Baäm, which lies about 3 miles southward of Kasiui, is 259 feet (78^m9) high, near its northern end; between 50 this hill and a lower one at the southern end there is a low sandy strip covered with vegetation. The island is fringed by a reef, which dries.

Tioor, situated about 5½ miles southward of Baäm, is almost entirely occupied by rugged hilly land, attaining an elevation of 1,230 feet

Charts 942b, 2759a.

Chart 3243.

(374^m9). The northern and greater part of the east coast is fringed by a reef which dries. Shoals, with depths of 23 and 33 feet (7^m0 and 10^m1) over them, lie off the middle of the eastern side of the island, about three-quarters of a mile and 1½ miles, respectively, offshore.

Uran lies on a reef, which dries, about 6½ miles eastward of Tioor; it is low and sandy.

Anchorage.—Temporary anchorages may be obtained, in a depth of 21 fathoms (38^m4), stones, north-westward of Ingar, but the tidal streams here may be strong.

Temporary anchorage may be obtained northward of Kampung Ilila, at the northern extremity of Watubela, and in Straat Horot Lomi, but the holding ground is bad and the tidal streams are strong.

A vessel of moderate draught with local knowledge might obtain temporary anchorage off the edge of the coastal reef at Temeer Barat, a village situated on the western side of Kasiui, about 1½ miles from the southern end, but the bottom is steep and stony, and there is a tidal stream.

Anchorage may be obtained off Rumah Lusi, a village situated on the north-eastern side of Tioor, during the East monsoon and transition periods, in a depth of about 30 fathoms (54^m9), sand and stones, out of the tidal streams. There are depths of from 38 to 49 fathoms (69^m5 to 89^m6) close outside this anchorage.

Tidal streams.—The tidal stream sets generally eastward with the rising tide at Watubela eilanden, and westward with the falling tide. The rate between the islands is considerable, the west-going stream during the East monsoon being the stronger, and the east-going stream during the West monsoon. Northward of Baäm, in February and March, an east-going stream with a rate of 3½ knots has been observed.

Along the north and south coasts there are heavy tide-rips during the full strength of the stream, and they should be avoided.

With a west-going stream there is slack water along the west coast of the larger islands of the group, and along the east coast with an east-going stream.

KAI EILANDEN.—This archipelago, situated south-eastward of the Watubela eilanden, consists principally of Nuhu Tjut, Nuhu Rowa group, Tajandu eilanden, Drie Gebruders, and Kur, Kaimeer, Tengah and Bui eilanden.

Nuhu Tjut can be distinguished from the Nuhu Rowa group by its mountainous aspect, the latter being generally low. There are a few rivulets in Nuhu Tjut; there are no roads, and only a foot-path between some of the villages. The original inhabitants of the group, who form the greater number, are a cross between Malays and Papuans. They live chiefly by the cultivation of coconuts and from the building of praus. Tual, situated in the Nuhu Rowa group, is the capital of the group.

Standard time.—See page 5.

Kaimeer group.—**Anchorage.**—**Dangers.**—Kaimeer (*Lat.* 5° 10' S., *Long.* 132° 01' E.), 492 feet (150^m0) high, is the northernmost island of the western group and lies about 27 miles south-south-eastward of Tioor; its remarkable terrace formation and flat upper part gives it the appearance of a large fort from seaward. See view

Charts 942h, 2759a.

Loholi
bearing 080°, 21 miles.

Pondjung.

Manawoka.

Gorong eilanden from west-south-westward.

(Original dated 1933.)

Kasui.

^A
Bearing
079°.

Tioor.

Watubela eilanden.—Northern extremity of Tioor, bearing 079°, 24 miles.

(Original dated 1933.)

Baam.

Kasui.

Watubela eilanden.—Southern extremity of Baam, bearing 284°, 10½ miles.

(Original dated 1933.)

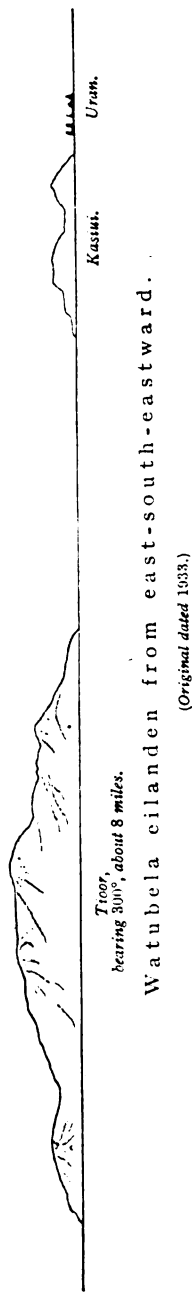
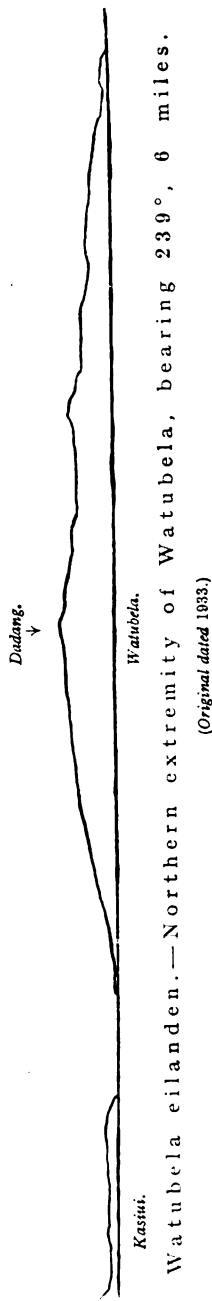
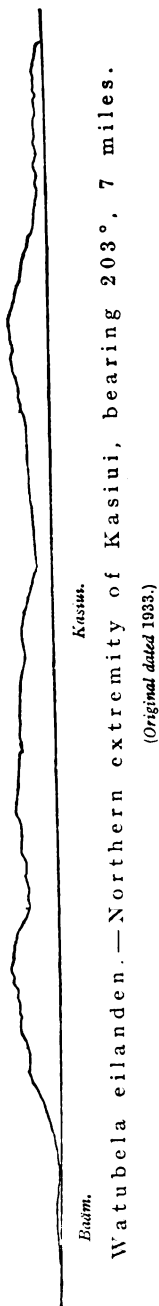


Chart 3243.

facing page 163. It is sparsely covered with vegetation; most of the coconut plantations are on the west coast; on the south-eastern coast are vertical rocky cliffs, and here there are some grottoes with stalactites. Kampung Kaimeer is situated on the west coast, and in it there is a noticeable mosque. 5

Tengah lies on the steep-to reef which dries close northward of Kaimeer; it consists of a sandbank covered with coconut trees; there are some temporary dwellings on the islet. Bui, lying at the northern extremity of the same reef, is 184 feet (56^m1) high; its northern coast is steep and rocky, but not high; the southern coast is mostly bordered by a sandy beach. The islet is uninhabited, wooded, and with coconut trees on its southern side. 10



Western extremity of Bui, bearing 191°, 8 miles.

(Original dated 1933.)

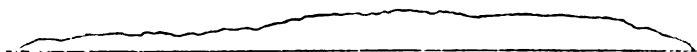
A reef, with a depth of 7 feet (2^m1) over it, lies close off the coastal reef about three-quarters of a mile eastward of the southern extremity of 15
Tengah, and a 6-foot (1^m8) patch lies about three-quarters of a mile farther northward; a drying reef lies about three-quarters of a mile northward of this patch.

There are no good anchorages off these islands. Temporary anchorage, however, may be obtained by vessels with local knowledge, during 20
the South-east monsoon in the bight on the western side, in the reef between Tengah and Bui, and during the North-west monsoon off the eastern side of Kaimeer, but the latter anchorage is in a depth of 38 fathoms (69^m5), very close to the reef, and there is always the possibility of the anchor slipping off the steep bank. 25

A vessel approaching the anchorage off the eastern side of Kaimeer from southward should pass at a convenient distance from the island; a rocky coast will first be seen, thence a small sandy beach as far as a dark, rocky mass, and farther northward another small sandy beach, terminating in Tandjung Wanatobur, a low rocky point. She should 30
anchor with this point bearing about 248°, southward of the 7-foot (2^m1) reef, which has a depth of 5 fathoms (9^m1) at its southern extremity.

A shoal, with a depth of 16 feet (4^m9) over it, lies about 9 miles north-north-westward of Bui, and two shoals, with depths of 29 and 36 feet 35
(8^m8 and 11^m0) over them, lie about 7 miles northward and 6½ miles north-north-eastward, respectively, of Bui.

Kur.—Kur, situated about 7 miles southward of Kaimeer, rises to 1,385 feet (422^m1) in Namsar (*Lat.* 5° 21' S., *Long.* 131° 59' E.), a sharp peak when seen from northward, situated about the middle of the island. 40



Namsar, bearing 141°, 8 miles.

(Original dated 1933.)

Charts 942b, 2759a.

Chart 3243.

At the northern extremity of the island is Soar, a flat summit, 286 feet (87^m2) high. The hilly land is steep on the east coast, but slopes gradually to the western side. Tandjung Songlijer, the northern
 5 extremity, is high, Tandjung Sermaaf, the north-western point, is a low spur, and Tandjung Batual, the southern extremity, is high and rocky. See view on page 165.

The coastal reef surrounding Kur is very steep-to, and consequently there are no good anchorages. A vessel with local knowledge, may
 10 however, obtain a temporary anchorage, in a depth of 38 fathoms (69^m5), during the South-east monsoon, near the coastal reef, off Kampung Nam, situated on the west coast about 2½ miles northward of Tandjung Batual; the bottom here is mostly sand. There is an inlet in the coastal reef here, which makes a good harbour for small vessels
 15 with local knowledge.

There are several small villages in Kur, most of which are on the west coast standing in the midst of coconut plantations.

Drie Gebruders.—These islands, lying at the southern end of the western group of Kai eilanden, consist of Manggur, Wonin and
 20 Fadol, with no off-lying dangers.

Manggur, 135 feet (41^m1) high, lies about 11 miles southward of Kur; it is fringed by a reef which dries. Its northern end, where the inhabitants dwell, is low. Wonin, the north-western island, is 99 feet (30^m2) high; it is almost entirely fringed by a drying reef. It is
 25 uninhabited, although there are coconut plantations on it, as on the other islands. Fadol, the southernmost island, is 443 feet (135^m0) high, and has a general steep appearance; its coasts can be closely approached, especially on the eastern side, a drying reef extends from the other sides, especially from the low northern part, where a village is
 30 situated.

The only suitable anchorage off these islands is off the north-western side of Manggur during the South-east monsoon, and off its north-eastern side during the North-west monsoon.

Tajandu eilanden.—**Off-lying dangers.**—This group, consisting
 35 of three islands and several islets, lies eastward of Drie Gebruders. The principal peaks are the summit of Taam, 437 feet (133^m2) high, the southernmost island of the group; Ree, 105 feet (32^m0) high; the peak near the western extremity of Walir, 187 feet (57^m0) high, the middle island of the group; the peak on Heniaar, 180 feet (54^m9) high,
 40 situated close eastward of Walir; and the hill Radja, 279 feet (85^m0) high, which stands on the north-western extremity of Tajandu, the northernmost island.

There is a bight on the north-eastern side of Tajandu, but it is encumbered with dangers in its entrance, which are not marked by discoloration, and is therefore not recommended as an anchorage. There
 45 is a village at the head of the bight. Matotjanat, a rock covered with vegetation, lies close off Tandjung Matot, the north-eastern extremity of the island. In Kampung Jembro, situated on the north-western extremity of the island, there is a large mosque. Nutfer, a sandy islet,
 50 covered with light vegetation, lies on the coastal reef about half a mile northward of Jembro.

Rembang (*Lat. 5° 26' S., Long. 132° 23' E.*), a reef, with a least depth of 39 feet (11^m9) over it, sand and stones, occasionally slightly marked by discoloration, lies 6 miles north-north-eastward of the northern

Charts 942b, 2759a.

Chart 3243.

extremity of Tajandu. Telegraaf riffen, consisting of two shoals, seldom marked by discoloration, lying close together with a least depth of 52 feet (15^m8) over them, lie 3½ miles northward of Tandjung Matot.

A dangerous shoal, the depth over which is not known, was reported, in 1937, to lie about 3½ miles north-north-eastward of Tandjung Watlus, the western extremity of Tajandu. A shoal, with a depth of 19 feet (5^m8) over it, slightly marked by discoloration, lies about 2½ miles north-north-eastward of the same point.

Huisman rif, with a depth of 3 fathoms (5^m5) over it, sand and stones, lies about 6 miles north-westward of Tandjung Watlus; it is scarcely marked by discoloration, but owing to the clear water, the bottom can be seen.

A bank, with a depth of 52 feet (15^m8) over it, lies 7½ miles west-south-westward of Tandjung Watlus, and a shoal, with a depth of 29 feet (8^m8) over it, lies about 2½ miles west-south-westward of the same point.

Walir, an island, is separated from the south-western side of Tajandu by a passage encumbered with reefs which dry; it is uninhabited. Kampung Jamtil, in which there is a noticeable mosque, stands on the northern extremity of Heniaar. Watleu, an islet, lies on the drying reef extending from the southern extremity of Walir. Ree and Reejanat are two islets lying on a drying reef, separated from the western side of Walir by a channel encumbered with shoals at its southern end. Reejanat is low and thickly covered with vegetation.

Taam, which lies about 7 miles south-westward of Walir, is fringed by a drying reef and is steep everywhere. A number of rocks, covered with vegetation, lie on the fringing reef on the western side of the island. Watfera, one of these rocks, lying close southward of the western extremity, is steep with a flat summit, on which there is a tree, and seen from northward, appears to be a vessel with one mast; a white rock lies close northward of it.

The only anchorage is westward of Kampung Ohitoom, situated about half a mile southward of Watfera, in depths of from 14 to 28 fathoms (28^m6 to 51^m2), but it is not very satisfactory during the South-east monsoon, when the sea gets up, especially with a south-going stream.

Nunia, Nusreen and Nuwait, which lie together on a drying reef, about 1½ miles north-eastward of Tandjung Tungor, the northern extremity of Taam, are low and sandy islets, except Nuwait, which is covered with coconut trees.

Nuhu Rowa group.—This group consisting of two islands and a number of islets, is generally low. The southern and larger island has no separate name, but is named from north to south: Nuhu Tawun, Nuhu Efruan and Nuhu Tutut. Kai Dulah, the other island, is separated from Nuhu Efruan and Nuhu Tawun by Straat Rosenberg. There are a few hilly ridges, from about 200 to 300 feet (61^m0 to 91^m4) high, on the larger island, and Gelanit, a peak on the eastern side of Nuhu Tawun, which stands about 3½ miles south-south-westward of the northern extremity, attains an elevation of 390 feet (118^m9).

Northern part of Nuhu Rowa.—Dangers.—Ender rif (*Lat.* 5° 20' S., *Long.* 132° 41' E.), with a depth of 19 feet (5^m8) over it, lies about 13½ miles north-north-westward of Tandjung Serbat, the low and sandy northern extremity of Kai Dulah.

Charts 942b, 2759a.

Chart 3440, plan of Northern portion of Noehoe Rowa.

Batavier rif, with a depth of 17 feet (5^m2) over it, and Datu rif, with a similar depth, lie 3 miles north-eastward and one mile northward, respectively, of Maas, an islet situated 6½ miles north-north-westward of Tandjung Serbat. Tegal rif, with a depth of 23 feet (7^m0) over it, lies 3 miles north-north-eastward of Tandjung Serbat. These reefs are all marked by discoloration.

Maas and Baëer, an islet situated close westward, are low and covered with coconut trees. Between Maas and Tandjung Serbat are 10 the islands Sua and Rumadan, and between the latter and the northern end of Nuhu Tawun is Du Rowa. A shoal with a depth of 23 feet (7^m0) over it, was reported, in 1952, to lie about one mile northward of the north-western extremity of Du Rowa; its position is approximate.

15 Charts 3440, plan of Northern portion of Noehoe Rowa, 3243.

Straat Du Rowa and approaches.—Dangers.—Beacons.—Straat Du Rowa, between the southern side of Du Rowa and Nuhu Tawun, has a navigable width of about half a mile between the reefs on either side. In its western approach are Er and Godon, two low 20 islets covered with coconut trees, each lying on a detached reef about half a mile apart and about 3 and 1½ miles, respectively, north-westward of Tandjung Ngidiun, the north-western extremity of Nuhu Tawun. There is a noticeable tree on the western side of Er.

A detached reef, which dries, and well marked by discoloration, lies 25 about one mile northward of the north-western extremity of Er; on its south-eastern extremity there is a bright white sand patch. A shoal, with a depth of 16 feet (4^m9) over it, lies about three-quarters of a mile northward of this reef, and a 26-foot (7^m9) patch lies about one mile eastward.

30 Chart 3440, plan of Northern portion of Noehoe Rowa.

Two shoals, neither of which are marked by discoloration, with depths of 19 and 26 feet (5^m8 and 7^m9) over them, lie about 2½ and 3 miles, respectively, north-eastward of Tandjung Ngidiun.

Two iron beacons stand on the southern edge of a detached reef 35 off the south-western side of Du Rowa and on the edge of the ridge which fringes the southern side of that island, respectively. Vessels should keep 2½ cables southward of these beacons.

There is a bight on the northern side of Nuhu Tawun, which is encumbered with shoals; at its head is Kampung Ohoideer, in which 40 there is a distinctive church. Krus and Ut are low islets lying on the southern side of the fairway northward of this bight. There is a distinctive sandy beach on the northern side of Krus. About 2 miles eastward of Ut, is the island Ubur. (*Lat. 5° 35' S., Long. 132° 43' E.*).

In the north-eastern approach to Straat Du Rowa there is a shoal 45 with a least depth of 23 feet (7^m0) over it, situated in the fairway, 1½ miles westward of Tandjung Serbat, and there is a shoal, on which there is a rock which dries, lying about half a mile eastward of the eastern extremity of Du Rowa.

Tidal streams.—The tidal streams in Straat Du Rowa set east- 50 ward with the rising tide, and westward with the falling tide.

Chart 3440, plans of Northern portion of Noehoe Rowa, and Approaches to Tocel.

Rede Tual.—Dangers.—Beacon.—This roadstead is situated between the western side of Kai Dulah and the northern end of Nuhu

Charts 3243, 942b, 2759a.

Chart 3440, plan of northern portion of Noehoe Rowa, and approaches to Toeal

Tawun. Between Kampung Dulah (Doeflah), which lies on the western side of Kai Dulah about $3\frac{1}{2}$ miles south-south-westward of Tandjung Serbat (*Lat. $5^{\circ} 31' S.$, Long. $132^{\circ} 48' E.$*), and Kampung Tual, situated $4\frac{1}{2}$ miles farther southward, there are some relatively high hills, attaining an elevation of 376 feet (114^m6).

The limits of the roadstead are imaginary lines drawn in a 225° direction through the point situated 2 miles south-south-westward of Kampung Dulah, and 045° through the south-eastern extremity of 10 Fair (*see below*).

A detached reef, with a least depth of 3 feet (0^m9) over it, situated about half a mile east-south-eastward of the south-eastern extremity of Ubur, is marked by a black beacon surmounted by a cone. Another detached reef, with a least depth of 3 feet (0^m9) over it, lies with its northern end about $6\frac{1}{2}$ cables southward of the same point, and is marked by a spar buoy. In 1952 the spar buoy was reported to be missing. 15

A safe anchorage may be obtained during both monsoons in Rede Tual, in depths of from 11 to 13 fathoms (20^m1 to 23^m8). Anchorage may also be obtained during the South-east monsoon off Kampung Dulah; heavy squalls occur here during the North-west monsoon. 20

There is a small shallow inlet in Kai Dulah, abreast Kampung Tual, available for small craft. There is a small pier.

Tual, the principal village of Kai eilanden, is the headquarters of a Government official. Provisions can be obtained. There is a 25 mosque in the village, and a hospital at Langgur, situated, in Straat Rosenberg, about $1\frac{1}{2}$ miles southward.

Bocht van Gelanit is an inner bay, separated from Rede Tual, by Fair, a low island, consisting of two basins, with depths of over 5 fathoms (9^m1) in them, connected with each other by a bar, with a least depth of 12 feet (3^m7) over it. The entrance channel southward of Fair is narrow and tortuous, with a least depth of 18 feet (5^m5) in it, and is only available for small craft with local knowledge.

Rainfall.—*See page 27.*

Chart 3440, plan of Northern portion of Noehoe Rowa.

Directions.—A vessel approaching Rede Tual from northward should steer for Tandjung Serbat bearing 180° , which leads about $1\frac{1}{2}$ miles westward of Tegal rif. When the rocky islet lying close off Tandjung Lobi, situated about 4 miles south-south-westward of Tandjung Serbat, bears 210° , she should steer for it on that bearing until abeam of Kampung Dulah, when she should steer for the sandy patch on the north-eastern point of Ubur, situated about $1\frac{1}{2}$ miles westward of Tandjung Lobi, bearing about 246° , until the mosque at Tual is open westward of the point northward of it, when she should alter course southward and be guided by the beacons to the roadstead. 45

A vessel approaching from north-westward should, from a position about 10 miles northward of Tandjung Ngidiun, steer for that point, which can always be easily identified, bearing 180° , until Godon is nearly abeam, when she should alter course eastward and keep the north-western quarter of Er, astern, open northward of Godon, passing 50 between the 19 and 26-foot (5^m8 and 7^m9) shoals north-eastward of Tandjung Ngidiun; the two beacons on the northern side of Straat Du Rowa, which should here be kept open, are sometimes difficult to distinguish from westward or north-westward.

Charts 3243, 942b, 2759a.

Chart 3440, plan of Northern portion of Noehoe Rowa.

A vessel with local knowledge can pass between the 26-foot (7^m9) shoal mentioned above and the western beacon by keeping the south-western extremity of Ut (*Lat. 5° 36' S., Long. 132° 40' E.*) in line with
 5 the somewhat flat hill Gelanit, bearing about 161°, and also in line with the western extremity of Krus. When the two beacons come in line, bearing about 085°, the vessel should alter course eastward and steer into the strait, keeping towards the northern side until Muha Nuhu Janat, a small islet lying close off the middle of the southern
 10 side of Du Rowa, bears 000°, when she should steer round the northern end of Ubur and be guided by the beacons into Rede Tual.

A vessel approaching Straat Du Rowa from south-westward should pass between Tandjung Ngidiun and Godon, steering for the rocky southern extremity of Sua (page 168), bearing about 049°. The north-
 15 western point of Ngaf, an island situated about 2 miles south-westward of Tandjung Ngidiun, should be kept open north-westward of that point until the two beacons on the northern side of the strait are nearly in line, when the vessel should follow the directions for approaching from north-westward.

Chart 3243.

Western side of Nuhu Rowa group.—Coast.—The western coast is mostly rocky, varied by an occasional sandy beach and fringed in places by a wide reef which dries; the land is hilly. The villages on the coast are often rendered obvious by a small church or mosque.

25 **Kampung Totoad**, which is especially noticeable owing to its mosque, is situated on the southern side of the entrance to an inlet extending southward; it is the headquarters of the surrounding district of the same name, and there is a small pier here. Two islets lie in the entrance to this inlet; two villages stand on the eastern shore of the
 30 inlet, about one mile and $2\frac{1}{2}$ miles, respectively, southward of the islets. There is usually a strong stream running out of this inlet. The coast southward of the entrance to this inlet is low and sandy for about $3\frac{1}{2}$ miles, as far as Kampung Watngit, thence it becomes steeper towards Tandjung Arat, the south-western extremity of Nuhu Tutut.

35 **Offlying islands and dangers.**—A 23-foot (7^m0) patch lies about $1\frac{1}{2}$ miles south-westward of Ngaf, and Mitliler, with a depth of 15 feet (4^m6) over it, lies about $2\frac{1}{2}$ miles southward of the same island. Foul ground extends about 4 miles southward from Uhiwa, an island lying $4\frac{1}{2}$ miles south-south-eastward of Ngaf. UHITEER is an island
 40 lying on the eastern edge of this foul ground about a mile south-south-eastward of Uhiwa. A reef, which dries, lies about three-quarters of a mile westward of the southern extremity of UHITEER, and a detached shoal, with a depth of 13 feet (4^m0) over it, marked by discoloration, lies about $2\frac{1}{2}$ miles south-westward of the same point.

45 Numerous islands and reefs lie from 7 to 13 miles from the western side of the main island of Nuhu Rowa group, with deep channels between them which are easily navigated if the reefs are visible. The outermost danger off Nuhu Efruan is Mitfeer, with a depth of 23 feet (7^m0) over it, lying nearly 8 miles offshore, about $8\frac{1}{2}$ miles south-
 50 south-westward of Ngaf.

Ur (*Lat. 5° 51' S., Long. 132° 32' E.*) and Utir, 236 and 184 feet (71^m9 and 56^m1) high, respectively, lie on a reef which dries, nearly one mile apart, about 7 miles west-north-westward of Tandjung Arat. A 29-foot (8^m8) patch lies about $2\frac{1}{2}$ miles westward of the northern

Charts 942b, 2759a.

Chart 3243.

extremity of Utir. Nuhu Taa is a low sand patch lying in the middle of a reef which dries, about 3 miles westward of Utir. Var, a rock, 79 feet (24^m1) high, lies on the southern edge of the reef. A 29-foot (8^m8) patch and a 17-foot (5^m2) patch lie about one mile north-westward and 7 cables northward, respectively, of the northern side of Nuhu Taa. 5

Kai Tanimbar, the south-westernmost island of the group, 174 feet (53^m0) high, and rocky, lies about 5½ miles south-south-westward of Utir; there is a round-topped tree on its summit. Warna 10 is a small islet lying on the fringing reef close off the northern extremity of the island. Kampung Atnebar stands on a steep hill at the head of the bight, which partly dries, on the northern side of the island. There is a small harbour, which dries, for praus close off the village. 15

A shoal, with a depth of 33 feet (10^m1) over it, and a 49-foot (14^m9) patch lie about 5½ miles south-south-eastward and 13 miles south-eastward, respectively, of the southern extremity of Kai Tanimbar. Two shoals, with depths of 7 fathoms and 29 feet (12^m8 and 8^m8) over them, lie about 4 miles south-eastward and 7 miles eastward, respectively, of the eastern extremity of the same island. 20

Directions.—Anchorage.—A vessel proceeding from Tual to Totoad, after passing through Straat Du Rowa, and westward of Ngaf, should steer for the western extremity of Nai, an island, 194 feet (59^m1) high, lying about 5 miles south-south-westward of Ngaf, 25 bearing 180°, until the distinctive hill Gelanit bears 088°, when she should steer for the eastern half of Liek, an islet bearing about 151°, until the southern extremity of Hoa, an islet situated about half a mile southward of Nai, is in line with the southern extremity of Vatilmas, bearing about 266°; thence she should alter course southward and 30 pass on either side of the 13-foot (4^m0) shoal which lies about 2 miles south-south-westward of Uhiteer, and when the northern side of Tonguin, an island situated about 2½ miles southward of Hoa, bears 264°, she should alter course to 084° and steer with it on that bearing astern, which leads northward of Liek, and thence to the anchorage, 35 taking care to avoid the 11-foot (3^m4) patch about half a mile south-westward of Wahru, situated about 1½ miles south-eastward of Uhiteer. (*Lat.* 5° 43' S., *Long.* 132° 48' E.).

There is a shorter route for vessels with local knowledge by passing between Tandjung Ngidiun and Ngaf, thence following the coast as 40 far as Wahru, but it is essential that the reefs should be plainly visible.

Eastern and southern sides of Nuhu Rowa group.—Off-lying dangers.—Anchorages.—The southern part of the eastern side of Kai Dulah is somewhat lower than the northern part. Tandjung Vadsit, the southern extremity is a steep headland, 36 feet (11^m0) 45 high. Kampung Naäm is situated on the sandy north-eastern point of the island.

Straat Rosenberg, which separates the south-western side of Kai Dulah from Nuhu Efruan and Nuhu Tawun, is narrow and tortuous, and has a depth of not more than 6 feet (1^m8) in it. 50

From a position just northward of Tandjung Vadsit to Kampung Abean, situated about 9½ miles southward of that point, the depths lying within 100 fathoms (182^m9) are very irregular, and there are a number of dangers lying within 1½ miles of the coast, including two

Chart 3243.

sandy patches which dry, the northern, situated about $2\frac{1}{2}$ miles eastward of Tandjung Vadsit (*Lat. $5^{\circ} 42' S.$, *Long. $132^{\circ} 48' E.$*), and the southern with its northern extremity about 2 miles south-eastward of that point. Between Abean and Tandjung Hoar, a rocky point lying nearly 6 miles south-south-westward, the coast is low.*

Between Tandjung Hoar and Tandjung Muslenar, a rocky point situated about 3 miles westward, the coast is fringed by a reef which dries, and a bank, with depths of from 6 to 16 feet (1^m8 to 4^m9) over it, extends about 2 miles southward from the latter point. Mitroa, a shoal with a depth of 16 feet (4^m9) over it, and usually slightly marked by discoloration, lies 3 miles southward of the same point.

Telok Uf, entered between Tandjung Muslenar and Tandjung Doan, situated about $1\frac{1}{2}$ miles westward, affords sheltered anchorage in both monsoons, in depths of from 33 to 39 feet (10^m1 to 11^m9), sand. Pulu Noiko, a small islet, lies about half a mile south-south-eastward of Tandjung Doan, and three shoals, with depths of from 13 to 19 feet (4^m0 to 5^m8) over them lie in the middle of the entrance. Tandjung Doan is easily identified by its yellowish red colour of the rocks, and by the crest of the 194-foot (59^m1) hill about one mile northward of it.

To enter the bay a vessel should steer for the mangrove point situated on the western side, about $1\frac{1}{2}$ miles north-eastward of Tandjung Doan, bearing 000° , until an outstanding rocky point on the eastern shore situated about three-quarters of a mile northward of Tandjung Muslenar bears about 090° , when she should keep in mid-channel. It is inadvisable to pass between Tandjung Doan and Pulu Noiko.

Anchorage may be obtained by vessels with local knowledge off Kampung Ohoideer Tutut, situated on the eastern shore of the bight between Tandjung Doan and Tandjung Arat. There is a small but noticeable church in the village.

Nuhu Tjut.—Aspect.—This island, the easternmost of the Kai eilanden, is separated from Nuhu group by Straat Nerong. It is generally mountainous with spurs extending to the coast on either side. The peaks at the northern end of the island are more difficult to identify than those farther southward. The principal peaks, which are all wooded, from north to south are:—Wokra, 2,254 feet (687^m0) high; Kaar, 2,431 feet (740^m9) high, with a sharp summit; Boo, 2,599 feet (792^m2) high, with a serrated summit; Drietopberg, 1,932 feet (588^m9) high, which has three peaks of the same elevation, situated about 3 miles southward of Boo; Daab, 2,621 feet (798^m9) high, the highest peak, with a blunt cone, which is usually obscured by clouds; Fakoi, 2,028 feet (618^m1) high, descending vertically on its south-eastern side, and having numerous bare yellow stony patches, situated $2\frac{1}{2}$ miles southward of Daab; Sitjek, 1,490 feet (454^m1) high, with a truncated cone, situated about 2 miles south-westward of Fakoi; Warhuk, 1,814 feet (552^m9) high, has the appearance of the back of an elephant with its head facing southward. Thence to Tandjung Weduar, the steep southern extremity of Nuhu Tjut, the highest peak is Nonaibal, with an elevation of 1,883 feet (573^m9), situated about 11 miles from Tandjung Weduar; Advilnas, 1,244 feet (379^m2), which stands about 2 miles northward of Nonaibal, is also outstanding. See view facing page 163.

The coasts of Nuhu Tjut are particularly subject to violent squalls,

Charts 942b, 2759a.

Chart 3243.

known as Valwinden, which sweep down from the mountains on to the east coast during the north-west monsoon and on to the west coast during the south-east monsoon. These squalls are dangerous to small craft and call for vigilance in larger vessels, especially when at anchor. 5

On the east coast Valwinden are particularly strong in the vicinity of Fakoi, near the centre of that coast; on the west coast they are strongest at the southern end of the island, between Nerong and Fer.

Straat Nerong.—This channel is deep and clear of dangers in the fairway. Approaching from southward or south-westward, the high land of Nuhu Tjut will first be sighted resembling two coffins, one very large, formed by the mountains and hills between Kampung Fer, situated about 4 miles north-north-eastward of Tandjung Weduar, and Nonaibal, and the other, much smaller and lower, at the southern extremity of the island, formed by the ridge between Tandjung Weduar (Lat. 6° 00' S., Long. 132° 50' E.) and Kampung Weduarfer, situated 1½ miles northward. 10 15

Western side of Nuhu Tjut.—Coast.—Anchorages.—The principal landmark at the northern end of the island, is the moderately high spur from the mountains which terminates in Tandjung Borang, the northern extremity, and which is usually the first land sighted from northward. The mountains farther southward are usually obscured by clouds. 20

Telok Wair, entered between Tandjung Borang and Tandjung Patingru, situated about 2 miles west-south-westward, affords safe anchorage to vessels with local knowledge during the South-east monsoon, in a depth of about 22 fathoms (40^m2), at a moderate distance offshore. Kampung Wair is situated at the head of the bay. 25

The west coast is less steep-to than the eastern, especially along the northern half, but vessels can navigate relatively close offshore. Tandjung Patingru is a rocky headland, 30 feet (9^m1) high, formed by a gently sloping spur, and is rendered obvious by the rock, Niv, which lies close north-westward of it. Thence to Kampung Hor, situated about 4½ miles south-south-westward, the coast is moderately high, with numerous white patches on the grey rocks. Southward of Woho a mountain 1,854 feet (565^m1) high, which rises almost vertically, situated about three-quarters of a mile north-eastward of Hor, the coast continues rocky with fairly well defined points, and the mountains recede inland. There are several villages on this coast, all of which are noticeable and some have white mosques. 30 35 40

Anchorage may be obtained anywhere northward of Baai van Elat, described below, during the South-east monsoon, in depths of from 18 to 30 fathoms (32^m9 to 54^m9); there are, however, heavy squalls during that period. 45

Off-lying dangers.—There are several shoals, which dry, lying within 2 miles of the coast between Tandjung Hebri, situated about 11 miles south-south-westward of Tandjung Patingru, and Tandjung Jarleier, which lies about 8½ miles farther southward. Of these, Mituwat lies about 3 miles south-westward of Tandjung Hebri; Mitduan, in two parts, lies about one mile farther southward, and Mitnaloa lies about 1½ miles west-south-westward of Tandjung Jarleier. A 10-foot (3^m0) patch lies about 1½ miles southward of Mitduan. The channel between these dangers and the coast is deep and safe. 50

Charts 942b, 2795a.

Chart 3243.

Baai van Elat.—Dangers.—Beacons.—This bay, entered about 2 miles south-south-westward of Tandjung Jarleier, affords a safe anchorage at all times of the year. The eastern side of the bay consists of undulating land covered with reeds and coconut palms, rising to Sitjek, which stands about $1\frac{1}{2}$ miles inland. The rocky islets Nuhu Ru, Krad and Sfat lie on reefs, which dry, on the eastern side of the bay, and Nuhu Jaan, 66 feet (20^m1) high, lies on the western side of the entrance. There is a deep channel eastward of Sfat leading to Kampung Elat.

A beacon stands about $1\frac{3}{4}$ cables off the north-eastern point of Nuhu Jaan (*Lat.* 5° 38' S., *Long.* 132° 59' E.). A 13-foot (4^m0) patch is situated about $3\frac{1}{4}$ cables west-south-westward of Krad and another 13-foot (4^m0) patch, lies about 6 cables north-westward of the northern extremity of Sfat. A beacon, with a black truncated cone, stands about $1\frac{1}{2}$ cables westward of the western extremity of Sfat; the top-mark was missing in 1953. A 23-foot (7^m0) patch lies about 4 cables west-south-westward of the same point.

The passage between the southern extremity of Nuhu Jaan and the main island is only available for small vessels with local knowledge.

Anchorage.—Directions.—Anchorage may be obtained by vessels with local knowledge during the South-east monsoon, in a depth of about 14 fathoms (25^m6), sand, westward of the pier (*see* below). During the North-west monsoon it is better to anchor nearer Nuhu Jaan, in depths of from 14 to 16 fathoms (25^m6 to 29^m3), sand and coral, with Kampung Raharin, situated on the southern shore about $6\frac{1}{2}$ cables south-westward of the pier, bearing 180°.

A vessel approaching the harbour should steer for a light green hill on Sfat, which is visible a considerable distance, until the beacons are identified, when there is no difficulty in entering; it should, however, be noted that foul ground extends about $1\frac{1}{4}$ cables outside the beacon north-eastward of Nuhu Jaan.

Elat.—This village, also known as Bandan Elat, stands at the head of the bay. There is a pier here with a red shed on it, with a depth of 16 feet (4^m9) off its head. Eastward of this pier there is another small pier, which is in a state of decay, with a flagstaff at its root.

Provisions and good drinking water can be obtained.

Coast.—Anchorage.—From the western entrance of Baai van Elat to Kampung Werka, situated about 4 miles south-south-westward, the coast is bordered by rocks rising steeply from the sea, some of which are 66 feet (20^m1) high. At Tandjung Laer Majoran, which lies about $1\frac{1}{4}$ miles northward of Werka, there is a waterfall, from which boats can obtain water; a vessel can anchor in its vicinity. From Werka to Tandjung Larat, situated about 7 miles southward, the coast is relatively low and undulating. There is a small inlet at Kampung Nerong, which lies 5 miles southward of Werka, suitable for small vessels with local knowledge. Tandjung Larat is fringed by a reef which dries, on which are some rocks, named Aran.

Off-lying danger.—A shoal, which dries, with a 6-foot (1^m8) patch close northward of it, lies about $1\frac{1}{4}$ miles offshore, about $4\frac{1}{2}$ miles south-south-westward of Tandjung Laer Majoran.

Coast.—Anchorage.—Between Nerong and Fer, situated about 11 miles south-south-westward, very heavy squalls are experienced during

Charts 942b, 2759a.

Chart 3243.

the South-east monsoon. The best landmarks on this stretch of coast are: a white rock on the point westward of Nonaibal: Kampung Hoiko, standing at the head of a small inlet situated at the foot of a mountain with vertical sides about $3\frac{1}{2}$ miles south-south-westward of Tandjong Larat, and which can only be reached by praus; Dufin (Lat. $5^{\circ} 52' S.$, Long. $132^{\circ} 52' E.$), an islet lying on the coastal reef close southward of this inlet; the bay, at the head of which are the villages of Sungi and Ngafan, situated about 2 miles southward of Dufin; and the rocky islet, named Rerean, lying on the coastal reef, about $1\frac{1}{2}$ miles farther southward. 5

About three-quarters of a mile northward of Kampung Fer the coastal reef bends sharply westward and extends about $4\frac{1}{2}$ cables offshore, and close outside it there is a sand patch above water, which is sometimes white and at other times a dark colour, but is always plainly visible. Foul ground extends about $4\frac{1}{2}$ cables southward from this sand patch and about the same distance offshore. The village partly stands on two terraces on the slope of the land. About 4 cables southward of it is Kampung Langgear, in which there is a large mosque. Between the two villages there is a plain planted with coconut trees. 15

Anchorage may be obtained by vessels with local knowledge in any convenient depth, approaching with the mosque in Kampung Fer bearing about 124° , but care must be taken to avoid the tongue of reef with a depth of less than 10 feet (3^m0) over it which extends about 3 cables offshore close south-westward of this line of bearing. 25

Eastern side of Nuhu Tjut.—Coast.—Anchorages.—This side of the island is very steep-to and consequently there are no good anchorages; heavy squalls occur almost everywhere. During the transition period between the North-west and the South-east monsoons, whenever there are no heavy squalls, and there is no likelihood of easterly winds, a vessel can obtain anchorage anywhere along the coast, in depths of from 27 to 38 fathoms (49^m4 to 69^m5), sand. 30

From close south-eastward of Tandjung Borang (page 173) to Tandjung Oratu, situated about 2 miles south-eastward, the coast is bordered by rocks interspersed with sandy beaches, and foul ground, on which there is a patch of sand which dries, extends over three-quarters of a mile offshore. Labuan Dabu is a channel with depths of over 5 fathoms (9^m1) in it, lying westward of the sand patch; in its entrance there is a depth of 19 feet (5^m8), lying about $4\frac{1}{2}$ cables north-eastward of Tandjung Vorwahan, situated about three-quarters of a mile south-south-eastward of Tandjung Borang. 40

Hoh baai, entered between Tandjung Vorwahan, and a point which lies about 4 cables north-north-westward, has a bar, with a least depth of 23 feet (7^m0) over it, in its entrance. To enter, a vessel should pass about one cable from Tandjung Borang; the coastal reef extending from the point, is fairly well marked by discoloration. There are some huts on the western side of the bay. Only vessels with local knowledge should attempt to enter. 45

Anchorage may be obtained in Rede Ur, situated about 4 miles south-south-westward of Tandjung Oratu, in a depth of about 30 fathoms (54^m9), sand, about $2\frac{3}{4}$ cables from the coastal reef; the mountain stream Wer Ur flows out here. Watnus, a mountain, 2,021 feet (616^m0) high, which stands about 2 miles north-westward. 50

Charts 942b, 2759a.

Chart 3243.

appears as a sharp peak from the anchorage in clear weather. The peak, in line with the middle of the valley, through which the Wer Ur flows, leads to the anchorage; if the peak is not visible the bridge
5 over the Wer Ur, just northward of the village, should be steered for, bearing between 292° and 315° .

About $2\frac{1}{2}$ miles southward of Kampung Ur is Kampung Bandan Eli, in which there is a noticeable mosque; the village can also be identified by the numerous dark red roofs of the buildings. Approaching from
10 southward it is hidden behind Tandjung Kawus (*Lat. $5^{\circ} 25' S.$, Long. $133^{\circ} 09' E.$*), a high point with a small cupola on it. At Kampung Hollat, situated about 6 miles south-south-westward of Bandan Eli, there is a small opening in the coastal reef, in which small craft with local knowledge may obtain good anchorage. At Kampung Kilwaer,
15 situated about 4 miles south-south-westward of Hollat, there is a flagstaff. About $1\frac{1}{2}$ miles south-south-westward of Kilwaer is Kampung Jantimur, in which there is a small distinctive church.

Tandjung Wahadan, situated $2\frac{1}{2}$ miles southward of Jantimur, is rocky and rises steeply to the mountains inland. About $5\frac{1}{2}$ miles
20 farther south-westward is Kampung Jamtil standing on a steep hill, 66 feet (20^m1) high, and about 5 miles south-westward of Jamtil is Kampung Ohoiwait, standing in a prominent position on a steep hill, with in the middle of it an enclosure surrounded by a low stone wall.

Anchorage may be obtained by vessels with local knowledge, in
25 depths of from 16 to 22 fathoms (29^m3 to 40^m2), off Kampung Wenduar, situated on a hill about 2 miles north-westward of Tandjung Obahan, which lies $11\frac{1}{2}$ miles north-north-eastward of Tandjung Weduar, with a prominent house, standing close southward of the village, bearing 235° . There is a shoal, with a depth of 29 feet (8^m8) over it, not marked
30 by discoloration, lying about $2\frac{1}{2}$ cables offshore, east-south-eastward of the village.

Tandjung Obahan terminates in rocks about 30 feet (9^m1) high.

Chart 470.

ARU EILANDEN.—These islands, lying about 65 miles east-
35 ward of Kai eilanden and about the same distance from the coast of New Guinea, are mostly low and covered with vegetation. It is advisable not to approach them within depths of less than 10 fathoms (18^m3) except in case of necessity. The principal islands of the group are Kola, Wokam, Kobroör, Maikoor (Maikur), and Trangan,
40 which are only separated from one another by narrow channels of no importance for general navigation. The most important place in the group is at Dobo (page 180) on Pulu Wamar situated off the western side of Wokam.

The islands are sparsely populated. The Malay language is under-
45 stood throughout. Most of the villages on the east coast are built on rocks, and can only be reached on the seaward side by a ladder. The inhabitants live by agriculture and fishing. The entire trade is centred round Dobo, and pearl fishing is carried out extensively throughout the year, off the west coast during the South-east monsoon,
50 and off the east coast during the North-west monsoon.

Tidal streams.—Both northward and southward of the group, in the open sea, the tidal streams set generally eastward with the rising tide and westward with the falling tide.

Charts 942b, 2759a.

Chart 470.

Along the northern coast the stream sets south-east by east with the rising tide, and eastward of the Djedan eilanden (Jedan islands) curves to south-east by south and south-south-east, and then maintains the direction of the east coast as far as Mariri (*Lat. 6° 09' S., Long. 134° 52' E.*), off Kobroör. The stream setting between east and east-north-east to the southward of the group curves northward to the east of the Djin eilanden. These two streams meet off Mariri and turn towards the coast. Thus between the parallels of 6° 10' S. and 6° 20' S. circular streams are formed, which, with the rising tide, set mainly on to the coast, and with the falling tide set away from it. On the southern side of the entrance to the channel which separates Mariri eilanden from Penambulai, the streams appear to turn anti-clockwise, and on the northern side, clockwise.

From the zone referred to above, when there is a west-going stream northward and southward of the Aru eilanden, the streams off the east coast set in different directions. Northward of the parallel of 6° 10' S. the stream sets between north-north-east and north until abreast the Djedan eilanden, and thence northward mainly between north-north-west and north-west by north. Southward of the parallel of 6° 10' S. the stream sets southward, but sometimes takes a more easterly direction off the entrances to the channels between the main islands; southward of Djin eilanden, off the south-eastern side of Trangan, the stream sets west-south-west.

There is a maximum rate of about 2 knots off the north and south coasts, with both the east-going and west-going streams. Close off the northern extremity the rate is sometimes as much as $2\frac{1}{2}$ knots, and attains 3 knots close off the southern extremity, whilst the directions here are irregular. At the full strength of the streams, strong tide-rips, caused by the irregular depths, and having the appearance of dangerous shoals, are experienced near both the north and south coasts.

Along the west coast the stream sets southward parallel to the coast when it is setting eastward along the north and south coasts, and in the reverse direction when it is setting westward along those coasts; a rate of more than $1\frac{1}{2}$ knots has not been observed along the west coast.

In the entrances to the channels between the main islands there is frequently a strong out-going stream, which is only interrupted by a strong in-going stream during a few hours with the rising tide, and there may be a short period of slack water.

Standard time.—See page 5.

Northern side of Aru eilanden.—Warilau, the northernmost island, is separated from the northern side of Kola by Kola Watu; it is wooded, with high trees, and like the other islands in its vicinity, is uninhabited. There is a detached drying reef, with a grass-covered islet on its south-western side, lying about one mile north-eastward of Tandjung Watuleijuring, the northern extremity of Warilau. Ngoba, an islet lying about one mile off the north-western side of Warilau, is wooded. On the south-eastern side of the detached drying sandbank close south-westward of Ngoba, there is a small islet covered with grass on its south-western side. Toba, an islet lying about $1\frac{1}{2}$ miles westward of Warilau, is low but covered with high trees.

Charts 942b, 2759a.

Chart 470.

Djedan eilanden (Jedan islands), lying within $6\frac{1}{2}$ miles eastward of Warilau, are low but wooded. On Djedan, the outer island, there is a noticeable tree on its western side, whilst the trees on the eastern side attain an elevation of about 160 feet (48^m8). The banks which extend northward from Djedan eilanden dry about 3 feet (0^m9). When these banks commence to dry a strong tidal stream flows seaward through the various channels.

Lutur, situated about $1\frac{1}{2}$ miles south-westward of Djedan, has a small peak on its northern side, which projects just above the surrounding trees. Santigi, lying on the fringing reef on the south-eastern side of Lutur, is a group of mangrove islets. Surat, which lies $1\frac{1}{2}$ miles southward of Djedan, is a bare sand patch above water. The sandbank on the northern extremity of the drying bank which extends northward from Tapusur, situated 2 miles south-westward of Lutur, dries about 3 feet (0^m9).

Kola Watu is a fairly deep channel with no dangers in the fairway, but reefs extend from either shore in places, and are usually marked by discoloration. The entrance from westward is easy to navigate; Tiga eilandjes (*Lat. 5° 25' S., Long. 134° 31' E.*), three rocky islets covered with vegetation, on the northern side of the passage, are a good mark. The entrance from northward is through Kliplip Watu, close along the south-eastern side of Warilau; this channel, however, has not been thoroughly surveyed.

The entrance to Kola Watu from eastward leads along the southern side of Djedan eilanden, through the eastern outlet of the deep channel which separates the plateau on which the Djedan eilanden lie from Warilau and the islands south-eastward of it, which latter are covered with high vegetation; the northern part of this channel has not been thoroughly examined. This eastern entrance can be approached from seaward by sounding, and thence by keeping Lutur in line with the southern extremity of Lutur, bearing about 278°. The channel southward of Tapusur is only available for praus. In the channel between Tapusur and Lafusa, three-quarters of a mile north-westward, there is a least depth of 4 fathoms (7^m3).

Off-lying danger.—A shoal was reported, in 1945, to lie in *Lat. 5° 17' S., Long. 134° 45' E.*, about $6\frac{1}{2}$ miles north-eastward of the outer of the Djedan eilanden.

Western side of Aru eilanden.—Anchorage.—With the exception of the southern part of Trangan, which is hilly with fairly steep sides, the western side of Aru eilanden is a monotonous stretch of thickly wooded land. There are no good landmarks, so that a vessel must rely for fixing her position on the mouths of the various rivers and points, which necessitates being fairly close offshore. Anchorage may be obtained in depths of over 5 fathoms (9^m1) everywhere. Sounding is a good guide, even in the southern part, where the depths are irregular. In depths of over 5 fathoms (9^m1) the bottom is sandy, with mud in places, but within this depth there is reef formation.

Coast.—Danger.—Buar, an island separated from the western extremity of Kola by a shallow channel, is, like that island, low and covered with vegetation. It is fringed by a reef which extends about one mile from its western and northern sides. A detached shoal, with a depth of 2 fathoms (3^m7) over it, lies 2 miles south-westward of Buar.

Charts 942b, 2759a.

Chart 470.

Sungei Sisir Watu is the passage between Kola and Wokam; the western entrance, which lies about 5 miles southward of the north-western extremity of Kola, is narrow and tortuous, and in it the tidal streams are strong.

Off-lying islands.—Wasir and Udjir, situated about 11 miles west-south-westward and $9\frac{1}{2}$ miles south-westward, respectively, of Buar, are higher in the northern than the southern part. Along the western side of Wasir, which can be closely approached, are four large rocks, covered with vegetation, the northernmost of which 10 can be identified from a considerable distance.

Java reef, with a depth of $8\frac{3}{4}$ fathoms (16^m0) over it, lies about $3\frac{1}{4}$ miles northward of Wasir.

A small sandbank above water lies on the reef, which dries, extending from the western side of Udjir, situated nearly one mile south-south- 15 westward of Tandjung Tutupano (*Lat. $5^{\circ} 37' S.$, Long. $134^{\circ} 14' E.$*).

Straat Wasir, between Wasir and Udjir, is navigable by vessels of shallow draught; there are two reefs at its northern end, with depths of $2\frac{3}{4}$ and 3 fathoms (5^m0 and 5^m5) over them, and a reef, with a depth of half a fathom (0^m9) over it, lies $1\frac{1}{2}$ miles northward of the north- 20 eastern point of Udjir.

The channel between Udjir and Wokam is dangerous. A reef, with a depth of $2\frac{1}{2}$ fathoms (4^m6) over it, lies on the southern side of the fairway, about one mile eastward of Tandjung Samang, situated about $1\frac{3}{4}$ miles south-westward of the southern extremity of Udjir, 25 and about 5 miles farther north-eastward there is a line of reefs, which mostly dry, lying across the fairway and almost closing it, leaving a passage half a mile wide, with a depth of 6 fathoms (11^m0) in it. One of these reefs, near the middle of the channel, has a patch on it which is above water. This channel should only be used at low water as 30 the reefs do not always show by discoloration.

To enter from westward a vessel should keep close to the Udjir shore, and when the southern extremity of that island bears 000° , she should steer for the small above-water sandbank, which is plainly visible, situated about 2 miles from the south-eastern side of Udjir, 35 and when nearing it alter course to pass between it and a small drying reef which lies westward of it, thence the channel becomes wider.

Coast.—The coast of Wokam between Tandjung Samang and Tandjung Malakafani, situated about 4 miles south-south-westward, can be approached fairly closely.

Chart 470, plan of Dobo harbour.

Rede Dobo.—**Lights.**—**Beacon.**—**Buoy.**—The limits of this roadstead, which lies between the coast of Wokam and the north-eastern side of Wamar, are imaginary lines drawn 045° from Tandjung Ular, the north-western extremity of Wamar, and 225° from Tandjung 45 Merukujuring, situated $3\frac{3}{4}$ miles south-eastward of Tandjung Malakafani.

Wamar is a low island thickly covered with vegetation, fringed by a reef which dries. There are three distinctive rocks on the fringing reef about three-quarters of a mile southward of Tandjung Ular, and there are two similar rocks close off Tandjung Batu Dua (chart 50 470), the south-western point of the island.

The least depth on the leading line in the western entrance is 6 fathoms (11^m0).

A light is exhibited, at an elevation of 70 feet (21^m3), from a white

Charts 3243, 942b, 2759a.

Chart 470, plan of Dobo harbour.

iron framework structure, 43 feet (13^m1) in height, on Tandjung Ular.

A light is occasionally exhibited from a post on the head of the 5 pier at Dobo.

A submerged pile, marked by a white conical buoy is situated on the southern side of the fairway, about 1½ miles eastward of Tandjung Ular.

A white iron beacon, surmounted by a ball stands on the shore 10 reef on the southern side of the fairway, about 5½ cables west-north-westward of the light post at Dobo.

Tidal streams.—Outside the entrance to Rede Dobo the tidal streams set southward with the rising tide and northward with the falling tide. During the South-east monsoon the in-going stream is 15 weak, but the out-going stream attains a rate of 1½ knots, and is sometimes much stronger off Dobo.

Directions.—Anchorage.—Approaching from westward, four openings in the coast will be seen from a considerable distance, the third from northward being the entrance to Rede Dobo. On closing 20 the land, the lighthouse on Tandjung Ular (*Lat. 5° 45' S., Long. 134° 11' E.*) will be seen. A vessel should enter with the flagstaff at Dobo, or, if this cannot be distinguished, the northernmost building, which is a large black shed with a zinc roof, in line with the white beacon, bearing 116°, which leads over the southern extremity of the 25 bank extending from Tandjung Malakafani. The beacon is sometimes difficult to identify. When the light-structure on Tandjung Ular bears 220° the vessel should steer 101° until Tandjung Fanadjuring (Fanajuring), situated about 5 miles south-eastward of Tandjung Malakafani, is seen midway between Dobo and Tandjung Meru- 30 kudjuring, bearing 115°, which leads to the anchorage in depths of from 11 to 17 fathoms (20^m1 to 31^m1) near the pier. The reefs on either side may not be marked by discoloration.

Dobo.—The large village of Dobo is situated on the northern side of Wamar, about 2½ miles eastward of Tandjung Ular. It is the 35 principal place in the Aru eilanden and is the headquarters of a Government official.

Some provisions may be obtained. There is a harbour doctor.

Chart 470.

Coast.—Anchorage.—The north-eastern part of the bay, entered 40 between Tandjung Fatudjuring (Fatu-juring), situated about 18 miles south-south-westward, is encumbered with dangers. Shoals, the outer of which has a depth of one fathom (1^m8) over it, lie within 3 miles west-south-westward of Tandjung Toardefete, situated about 8 miles south-south-westward of Tandjung Fanadjuring. A shoal 45 was reported, in 1953, to lie about 2½ miles west-north-westward of Tandjung Toardefete; its position is approximate. Babi, a low islet, covered with high vegetation, lies 7 miles westward of Tandjung Toardefete; three rocks lie on the fringing reef, which dries, on the south-western side of the islet.

50 Anchorage may be obtained, in a depth of 11 fathoms (20^m1), about three-quarters of a mile eastward of the jetty on the western side of the bay situated about a mile eastward of Tandjung Fatudjuring. The bay is entered with the eastern end of Babi bearing 000°, astern, and a rock at the head of the bay bearing 180°, ahead; when the

Charts 3243, 942b, 2759a.

Chart 470.

white house on the jetty bears 258° steer for it on that bearing, and anchor when Tandjung Fatudjuring bears 323°. There is a reef off the western side of the bay, situated about a mile south-south-eastward of Tandjung Fatudjuring, which is marked by an unofficial beacon. 5
A shoal, with a depth of 2 fathoms (3^m7) over it, lies about 1½ miles north-westward of Tandjung Fatudjuring.

Sungei Manumbai and Sungei Workai are entered about 5½ and 7½ miles, respectively, southward of Tandjung Toardefete, and afford navigable channels for vessels with local knowledge to the east coast 10 of Aru eilanden.

Sungei Manumbai.—Directions.—Sungei Manumbai, is about 28 miles long and has a least depth of about 3 fathoms (5^m5) in it; it is the principal passage through the islands. The channels from its eastern entrance to seaward have not been thoroughly examined (*see* page 187). 15
With the rising tide the tidal streams set into both ends of the channel and with the falling tide set out, and may attain a rate of from 1½ to 2½ knots in the entrances.

In the approach to the western entrance of Sungei Manumbai there is a bank with a least depth of 2½ fathoms (4^m6) over it, but there is a 20 channel northward and eastward of it with a least depth of 3½ fathoms (5^m9) in it, leading into the entrance. A reef, which dries, extends south-westward from Tandjung Belingaratu, the northern entrance point of Sungei Manumbai, and should be given a good berth. On the southern side of the entrance is Kampung Manumbai (*Lat.* 6° 02' S., 25 *Long.* 134° 17' E.), off which there is a rock covered with light green vegetation, which is a good mark and can be passed close-to. Close eastward of the village there is a distinctive white rocky patch, in the vicinity of which the shore is rocky. About 3 miles eastward of the village there is a bight on the southern side, in which there are two 30 islets thickly covered with vegetation.

A vessel, after entering, should keep in mid-channel as far as this bight, thence the greatest depths, from 5 to 5½ fathoms (9^m1 to 10^m1), are close to the northern shore until past the mouth of Sungei Marirremaar, situated about 4 miles eastward of Kampung Manumbai; 35 elsewhere, except in the entrance, the depths are over 5½ fathoms (10^m1), and the channel is clear of dangers. After passing the entrance to Sungei Marirremaar, a waterfall will be seen about 3 miles farther, on the northern shore; near the entrance to Sungei Api Api, on the southern shore, about 4 miles east-north-eastward of Sungei 40 Marirremaar, there is a noticeable hillock. There is another hillock, covered with vegetation and with an outstanding tree on it, on a point on the southern shore, situated just westward of the position where the river trends eastward for a short distance. Rocks lie close to both shores in places. 45

About 1½ miles westward of the mouth of Sungei Dosi, in which there are some islets, lying about 9 miles east-north-eastward of Sungei Api Api, there is a rock which dries, which should be passed on its northern side. After passing the mouth of Sungei Féraun, situated on the northern shore, about 2 miles east-north-eastward of Sungei Dosi, 50 this shore should be kept aboard, but subsequently the southern shore should be closed by crossing between drying mudbanks in a least depth of 3 fathoms (5^m5).

Sungei Workai.—This channel, which separates Kobraör from

Charts 3243, 942b, 2759a.

Chart 470.

Maikoor, is available for vessels of heavy draught as far as Njamuk, situated about 4 miles within the western entrance, thence to the eastern entrance there is a least depth of $2\frac{1}{2}$ fathoms (5^m0), but in this
 5 entrance there is a depth of less than one fathom (1^m8). The narrowest part is at Ajer Bunga Radja, situated about 8 miles south-eastward of Njamuk. Local knowledge is essential.

For the north-eastern approach to Sungei Workai, *see* page 187.

Coast.—Between Tandjung Fatudjuring and the northern entrance
 10 point of Sungei Maikoor, situated about 8 miles southward, the coast is low, thickly covered with vegetation, and bordered by a narrow sandy beach. Several shoals, with depths of $3\frac{1}{2}$ and 5 fathoms (6^m9 and 9^m1) over them, lie about $2\frac{1}{2}$ miles off this stretch of coast, the positions of which may best be seen on the chart.

15 The entrance to Sungei Maikoor (Maikur), between Kampung Maikoor and Tandjung Ngoni, situated about 3 miles south-westward, is deep in the fairway and continues so until just above Kampung Taberfane, which stands on the southern shore about $2\frac{1}{2}$ miles within Tandjung Ngoni. A rock, which dries and is very steep-to, lies in the
 20 middle of the fairway off Taberfane. Sounding is a good guide when entering. The channel above this village appears to be deep, but is too narrow for vessels.

Off-lying dangers.—Between Tandjung Ngoni (*Lat.* $6^\circ 10' S.$, *Long.* $134^\circ 05' E.$) and the entrance to Sungei Serwatu, situated about
 25 17 miles southward, the coast is fronted by a number of reefs and shoals. Batavia reefs, consisting of two patches, with depths of $2\frac{1}{2}$ and 3 fathoms (4^m6 and 5^m5) over them, lie about 9 miles southward of Tandjung Ngoni and about 5 miles offshore. Shoals, with depths of from $3\frac{1}{2}$ to 6 fathoms (6^m9 to 11^m0) over them, lie about $8\frac{1}{2}$ miles
 30 offshore westward of these reefs, and a 5-fathom (9^m1) patch lies about 6 miles westward of Tandjung Faturei, situated about 15 miles southward of Tandjung Ngoni.

Sungei Serwatu.—This passage, entered close northward of Tandjung Deréhi, situated nearly 2 miles southward of Tandjung
 35 Faturei, extends to the east coast of Trangan. A channel, about $2\frac{1}{2}$ cables wide, with a least depth of $2\frac{1}{2}$ fathoms (5^m0) in it, leads into the entrance over a bank, with depths of less than 3 fathoms (5^m5) over it, which extends about $2\frac{1}{2}$ miles offshore northward of the entrance. This channel is reported to shift owing to the influence of the monsoons.
 40 In 1907, a vessel with a draught of 6 feet (1^m8), and 75 feet (22^m9) in length, proceeded as far as the entrance to Sungei Loloor, situated about 8 miles above the entrance.

Coast.—The coast between Tandjung Deréhi and Kampung Ngaibor which lies about 16 miles southward, is low and overgrown with reeds.
 45 It rises gradually inland. Ngaibor, which is the largest village on the west coast of Trangan, stands prominently on a small plateau. Close northward of it is Sungei Ngaibor, which is probably the largest fresh-water river in the Aru eilanden; it is about 75 yards (68^m6) wide at its entrance, and in the rainy season overflows its banks. Southward of
 50 Ngaibor the coast becomes rocky, but continues low as far as Tandjung Lelar, situated about 4 miles farther southward.

Off-lying dangers.—Several 5-fathom (9^m1) patches lie within $4\frac{1}{2}$ miles of the coast just southward of Tandjung Deréhi. A number of shoals, with depths of from $3\frac{1}{2}$ to 6 fathoms (6^m4 to 11^m0) over them,

Charts 3243, 942b, 2759a.

Chart 470.

lie within $6\frac{1}{2}$ miles of the coast between Tandjung Deréhi and Tandjung Lelar; their positions can best be seen on the chart.

Chart 3243.

A shoal, with a depth of 15 feet (4^m6) over it, lies about 36 miles 5 west-north-westward of Tandjung Lelar.

Chart 470.

Coast.—Between Tandjung Lelar and Tandjung Bain, situated about 5 miles south-south-eastward, and thence to Tandjung Ngabordamlu, which lies about 8 miles farther south-eastward, the coast is 10 rocky and steep, but is not high. The coastal reef between the two former points extends about three-quarters of a mile offshore, with a depth of about half a fathom (0^m9) over it. Bain, a hill, 295 feet (88^m9) high stands about $2\frac{1}{2}$ miles north-eastward of Tandjung Bain, and the mouth of Sungei Tafermaar, situated about $3\frac{1}{2}$ miles eastward 15 of the same point, are obvious, although Bain is only slightly higher than the land in its vicinity.

An islet, 120 feet (36^m6) high, and about the same height as Tandjung Ngabordamlu, lies on the drying reef which fringes that point. Batu Gojang, a grey bare rock, about 33 feet (10^m1) high, lies on the outer 20 edge of the same reef, and close eastward of it there is a rock which dries about 6 feet (1^m8). A reef, with a depth of $1\frac{1}{2}$ fathoms (2^m7) over it, lies $1\frac{1}{2}$ miles south-south-eastward of Tandjung Ngabordamlu (*Lat. $6^{\circ} 56' S.$, Long. $134^{\circ} 11' E.$*). The depths in the vicinity of this point are very irregular. The tidal streams are strong, there are heavy 25 tide-rips and usually a high sea. For further details of the streams, see page 176.

Off-lying dangers.—Blackburn bank, with a least depth of about $1\frac{1}{2}$ fathoms (2^m3) over it, lies about $7\frac{1}{2}$ miles west-south-westward of Tandjung Bain; it is frequently marked by breakers. Several patches, 30 with depths of 5 fathoms (9^m1) over them, lie within 8 miles southward of the shoalest part of Blackburn bank.

Eastern side of Aru eilanden.—**Coast.**—There are no good landmarks on the eastern side of Aru eilanden; the whole coast appears as one uniform stretch of land, and the off-lying islands are difficult to 35 identify from a distance.

Djedan eilanden, which lie off the north-eastern side of Kola have been described on page 178. The eastern coast of Kola is rocky for a great part, and thickly covered with vegetation. Kampung Marlassi is situated about $2\frac{1}{2}$ miles southward of the north-eastern 40 extremity of Kola, and close northward of the village is the mouth of the river of the same name. Kampung Masidan stands on a rock on Tandjung Leitin, situated about $2\frac{1}{2}$ miles south-eastward of Marlassi; from seaward these villages appear as light red patches. About $1\frac{1}{2}$ miles southward of Tandjung Leitin, there were, in 1894, two prominent trees. 45

Shoals, which dry, extend from 4 to 6 miles eastward from Kulur, an island lying close off the coast of Kola just southward of its north-eastern extremity and from the coast southward of it. The coast cannot be approached within 6 miles in this vicinity except through the channels in the reef, owing to the coastal reef and an extensive drying 50 reef outside it. Several islands, thickly covered with vegetation, of which Binaar, situated 2 miles southward of Tandjung Leitin, is the largest, lie on the coastal reef between Sungei Marlassi and Sungei Sisir Watu, which lies about 6 miles southward.

Charts 942b, 2759a.

Chart 470.

Off-lying islets and dangers.—Konan, a sandy, atoll-shaped islet, covered with vegetation, lies about $4\frac{1}{2}$ miles eastward of Binaar, on an extensive reef which dries, between which and the coast there is a channel; two rocks, covered with vegetation, lie on the reef close to the islet. Konan from a distance northward or southward, appears as two trees showing above the horizon.

Arar Kula, lying about 2 miles southward of Konan, is a coral and mud bank, partly above high water, with some low trees on it; it is separated from the reef extending from Konan by a narrow winding channel, and from the coast of Wokam by a fairly wide channel, with depths of from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms (6^m4 to 8^m2) in it, the southern entrance of which, however, is foul. Eastward of Arar Kula, the reef extends 2 miles, and, $3\frac{1}{2}$ miles east-south-eastward of the islet, is a detached reef, over which there is a depth of 2 fathoms (3^m7), which is sometimes marked by slight discoloration. The channels northward and southward of Arar Kula are used as the entrance to Sungei Sisir Watu, which is a means of communication for small craft between the eastern and western coasts.

Coast.—The coast southward of the entrance to Sungei Sisir Watu is, like that northward of it, thickly covered with vegetation and is rocky, as far south as Tandjung Komfane (*Lat. $5^{\circ} 39' S.$, Long. $134^{\circ} 44' E.$*), near the village of that name, situated about $6\frac{1}{2}$ miles south-eastward. There are several villages on this stretch of coast, of which Moha is the principal; they stand on rocks, and, like other villages on this coast, appear as light red patches. Kootbaai (Kutbaai), an islet lying on the coastal reef about a mile offshore eastward of Moha, is a good mark from south-eastward. Ikaguri, an islet which lies about three-quarters of a mile southward of Kootbaai, is difficult to distinguish from the land behind it.

The point lying one mile southward of Tandjung Komfane can be seen from a great distance from northward or southward, appearing then as several separate islands, owing to the gaps in the trees. On it is a group of high trees, the highest of which, with a hammer-shaped top, is easily identified from eastward or south-eastward. Southward of this point is Malumdidim, a wooded islet, and the islands of Wodinhun and Wahalaulau.

Watulai eilanden.—This group consists of a large number of rocky islands lying on an extensive reef, through which a few narrow channels give access to the numerous villages. The principal islands are Aduar, Kumul, Watulai and Tabar. Djursian (Jursian), with the adjacent islands, farther southward, are also considered as belonging to the group. Aduar, Kumul, Watulai and Djursian are inhabited.

Rewan, the north-easternmost of the group, situated about 5 miles south-south-eastward of Tandjung Komfane, consists of three islets lying close together, of which the south-western is the highest, whilst the other two are only slightly covered with vegetation; it is difficult to distinguish against the high land of Aduar. A bare rock, above water, lies on the reef south-westward of Rewan. Manien, situated about half a mile westward of Rewan, is thickly covered with vegetation; its western side is rocky and higher than the eastern; there is a sandy beach on the latter side.

Aduar, the highest of the group, is covered with high trees. There are several fairly large villages on the island. A mound, covered with

Charts 942b, 2759a.

Chart 470.

vegetation, lies on the southern side. A channel through the reef, with a depth of about $1\frac{1}{2}$ fathoms (3^m2) in the entrance, gives access to the villages. Ilmamui, which lies about 3 cables southward of Aduar, is lower than that island, and covered with vegetation. Ngoab, situated about 6 cables south-eastward of Ilmamui, is a rocky islet covered with low trees; it can be identified by two isolated coconut trees. 5

Kumul, which lies about 3 cables southward of Ilmamui, is thickly covered with vegetation. The south-eastern side of the island, on which there is a village of the same name, terminates in a narrow, bare, rocky tongue of land, which, from seaward, appears as a well defined light patch with a small clump of coconut trees on its northern side. 10

Watulai, which lies about one mile south-south-eastward of Kumul, has a bare patch on its northern side, similar to that on Kumul. Kampung Watulai is situated on the north-eastern side of the island. About three-quarters of a cable north-westward of the village, a prominent clump of trees, the top of which has an elevation of about 150 feet (45^m7), is a good mark for navigating the narrow channel through the reef leading close to the villages of Kumul and Watulai. Tabar, situated close westward of Watulai, is thickly covered with 20 vegetation.

Elel (*Lat. $5^{\circ} 50' S.$, Long. $134^{\circ} 48' E.$*), Menlau and Mentai are rocky islets covered with vegetation, lying on the reef within $1\frac{1}{2}$ miles south-eastward of Watulai. A small clump of coconut trees stands on the north-eastern point of Menlau, and there is a village on the north-western side. Mentai, the south-easternmost of the three islets, has the appearance of a plume. Ramje, Korlé, and Waria are rocky islets covered with vegetation, which partly obstruct the entrance to the inlet westward of Tabar. On the north-eastern point of Waria is the village of the same name, reached by a tortuous channel in the reef, leading southward of Mentai. 30

Djursian (Jursian) group consists of several rocky islands, thickly covered with vegetation, in which there are a number of deep inlets. The northern extremity of Djursian is the only good mark in the group which can be identified from seaward, and on a rock close to it is 35 Kampung Djursian.

Directions.—Anchorage.—About $2\frac{1}{2}$ miles north-eastward of Watulai, is the entrance to a narrow, but fairly deep channel, leading south-westward and westward towards Kampung Kumul and Watulai. The outer edge of the reef can be approached safely by constant sounding, and the best anchorage in the entrance to the channel is in a depth of 4 fathoms (7^m3); with the northern point of Kumul in line with Ngoab, bearing about 267° and the western of the two Maar eilandjes (page 186) in line with the eastern extremity of Menlau bearing about 194° . 45

Beyond the anchorage mentioned above local knowledge is necessary for navigating the channel, which, in places, is only about three-quarters of a cable in width; it has a least depth of $2\frac{1}{2}$ fathoms (4^m1) in it. The tidal streams run with great strength at springs, especially on the out-going stream. 50

Karaweira eilanden.—This group consists of thirteen uninhabited islands, which may be divided into two parts, the Karaweira Watulei and Karaweira Mariri; to the former belong Groot Karaweira and Sabir, both situated on the same drying reef; the Karaweira Mariri,

Charts 942b, 2759a.

Chart 470.

the southernmost of which is Dorlau, lie at the southern end of the group.

- Groot Karaweira, lying about 5 miles south-eastward of Djursian, is 5 243 feet (74^m1) high to the top of the trees and is the highest land on the east coast of the Aru eilanden; it is, like the other islands, rocky, thickly covered with vegetation, and bordered with large rocks; on one of these there are a few fishermen's huts. The highest tree is very prominent from between north-east and east, as its top resembles 10 a cross.

- Sabir, a low islet, lies on the edge of the reef about three-quarters of a mile eastward of Groot Karaweira; there is a small sandy inlet on its north-western side. The islet is divided into two parts by a ravine, and thus appears as two islets from a distance. A rock, above 15 water, resembling a lion lying down, lies near the south-eastern point. Some sandbanks, which dry about 3 feet (0^m9), lie on the coral reef on which both Groot Karaweira and Sabir are situated; this reef presumably extends westward as far as Maar eilandjes. Some low isolated trees stand on the southern part of the reef surrounding 20 Karaweira Mariri.

- Maar eilandjes (*Lat.* 5° 57' S., *Long.* 134° 47' E.) are two rocky islets, of which the western is the higher, lying about 3½ miles westward of Groot Karaweira. The eastern islet appears from a distance as two islets, which are connected by an above-water arch, forming a natural 25 bridge.

Approaches to Sungei Manumbai.—Dangers.—Anchorages.—

- The usual channel from northward leading to the entrance of Sungei Manumbai passes about 1½ miles outside Djursian in a west-south-westerly direction, thence turning southward and passing between the 30 Maar eilandjes; thence it leads between the reef extending from the Karaweira eilanden on the east and that extending from Wokam on the west. There is a least depth of a quarter of a fathom (0^m5) in this channel, situated 2 miles southward of Maar eilandjes.

- The entrance to this channel is bounded on the eastern side by the 35 narrow, sandy northern extremity of an extensive coral reef, situated about 2½ miles eastward of Mentai, with depths of from 1½ to 2½ fathoms (2^m7 to 4^m6) in it, the eastern side of which can be approached by sounding. A channel leading southward, with depths of from 2½ to 5 fathoms (5^m0 to 9^m1) in it, separates this reef from the shoals which 40 surround the Karaweira group. Anchorage may be obtained by vessels with local knowledge, in a depth of 5 fathoms (9^m1), mud and coral, in the entrance to the channel about 3½ miles from Kampung Djursian.

- Batu Kapal, situated in the south-eastern approach to Sungei 45 Manumbai, about 2½ miles south-south-westward of Dorlau, is a fairly high rock partly covered with vegetation, and when seen clear of the Kobroör coast, is a good mark. The rock is held sacred by the natives, who make offerings to it. There is foul ground on the northern and eastern sides, and the tidal streams are strong. A small atoll-shaped 50 sandbank, above water, lies about 3 miles south-south-eastward of Dorlau.

There are channels which lead northward and southward of this sandbank and thence southward of Batu Kapal to the mouth of Sungei Manumbai. In the northern channel there are depths of from 6½ to

Charts 942b, 2759a.

Chart 470.

11 fathoms (11^m9 to 20^m1), and off its entrance the tidal stream sets southward with the rising tide, and east-north-eastward with the falling tide. There is a distinctive white bare trunk of a tree on Leliling, an islet situated close northward of Kampung Warloi, on the east coast of Koboör, about 7½ miles south-westward of Batu Kapal. 5

With Dorlau bearing between 292° and 338°, the southern side of the channel is determined by means of the danger angle of 86° between Batu Kapal and the highest point of Sabir, and vessels should not close to within this arc, but a danger angle of 81° leads well clear 10 of the southern side.

In the southern channel, northward of the reef extending from Mariri there are several detached coral patches, with depths of 2½ and 3 fathoms (4^m6 and 5^m5) over them. A danger angle of from 29½° to 31½° between Batu Kapal and Dorlau will avoid these patches and the 15 least depth will be 3 fathoms (5^m5). The use of the angle is discontinued when the white tree on Leliling bears 236°. Southward of Batu Kapal there is good anchorage, mud and sand bottom. Westward of Batu Kapal, the channel has not been surveyed.

For description of Sungei Manumbai, *see* page 181. 20

Mariri eilanden.—Anchorage.—This group, consisting of Mariri (*Lat.* 6° 09' S., *Long.* 134° 51' E.) and Leer and several islets, of which Lola, the southernmost, is the most important, lies about 6 miles from the coast of Koboör. The group is to a great extent planted with coconut trees. 25

Mariri lying about 7 miles southward of Dorlau, has, on its northern side, two obvious trees, the tops of which have an elevation of 164 feet (50^m0), projecting above the surrounding wood, visible from north-eastward and south-eastward. Kampung Mariri stands on one of the islets close off the south-eastern extremity of Mariri, and is plainly 30 visible.

Anchorage may be obtained by vessels with local knowledge, in a least depth of 3½ fathoms (6^m9), about three-quarters of a mile offshore, with the village bearing 264°.

Leer, situated about 1½ miles south-south-westward of Mariri, is 35 thickly covered with vegetation, and can be identified by the considerable quantity of dead wood on it. Approaching from south-eastward it will be sighted about the same time as Mariri. On Lola there is a village, standing near an isolated clump of coconut trees on its southern extremity. 40

North-eastern approach to Sungei Workai.—Anchorage.—The south-eastern entrance of Sungei Workai, situated at the southern extremity of Koboör, is approached by a channel from north-eastward with very irregular depths leading between Lola and the northern end of Penambulai, lying about 3 miles southward. 45

A vessel approaching this channel should steer for the sandy eastern entrance point of Sungei Kangurma, situated at the northern end of Penambulai, bearing 210°, until the south-western extremity of Mariri is in line with Sedja, the southern of the two islets which lie close off the north-eastern extremity of Leer, bearing about 344°. Djarang 50 (Jarang), an islet lying about 1½ miles from the coast of Koboör, about 3 miles southward of Leliling, will then be open south-westward of Lola, bearing about 296°. The rate of the tidal streams here is sometimes 3 knots, setting offshore with the falling tide, and southward

Charts 942b, 2759a.

Chart 470.

with the rising tide. Thence the vessel should make good a course 242° until Epar, the double islet situated about $1\frac{1}{2}$ miles westward of the northern extremity of Leer, is open south-westward of Lola, bearing 5 about 330° , when she should make good a course 269° , which will lead to the anchorage which lies about 2 miles southward of Kampung Lola, where there are depths of from $5\frac{1}{2}$ to 6 fathoms (10^m to 11^m), sand, mud and coral.

For description of Sungei Workai, see page 181.

- 10 Off-lying islands.**—Penambulai, Barakan, lying close southward of it, and Workai, $3\frac{1}{2}$ miles farther south-westward, are, except for a few small parts, where the coast is rocky, very low, but are covered with high trees. Mimien, Wolvat, Lelamtuti, and Baun, islands lying between this group and the coast, have only been cursorily examined.
- 15** A clump of high trees, the top of which has an elevation of 164 feet (50^m), stands close northward of Kampung Rabal, situated on the east coast of Penambulai, about 3 miles south-south-westward of Tandjung Uafu Fendjuring (Fenjuring), the north-eastern extremity of the island; there are some noticeable high trees on the latter point, which
- 20** is bordered by a sandy beach. There is a tree with a bare trunk and thick crown on Tandjung Ki (*Lat. $6^{\circ} 27' S.$, Long. $134^{\circ} 50' E.$*), situated about 5 miles south-south-westward of Rabal.

The rocky north-eastern point of Barakan is a useful mark when approaching from northward. Close northward of the south-eastern

25 point and in the middle of the western side of the island, the vegetation is noticeably higher.

Several islands lie on the reef which surrounds Workai; this reef is steep-to on its eastern side. Turtur Djuring (Juring), one of these islands, situated close off the north-eastern side of Workai, is thickly

30 covered with vegetation and is moderately high; the eastern extremity can easily be identified from northward, as it appears as a knob. There is a sandy beach on the north-eastern side of the island.

Kultubai-Noord (North Kultubai), consisting of three small islets on which there are clumps of trees, of which the easternmost islet is

35 the largest, lies on the drying coral reef extending about $4\frac{1}{2}$ miles southward from Turtur Djuring; there is also a small sandbank above water on this reef. From southward these clumps of trees are difficult to identify against the higher land of Turtur Djuring, but from northward they are plainly visible, and the easternmost then

40 appears as two trees on the horizon.

There is a convenient roadstead southward of Kultubai-Noord, in the inlet in the extensive reef. In 1893, there was a prominent sacrificial post on the southern side of the roadstead, on the edge of the drying reef extending north-eastward from the Djin eilanden

45 (Jin islands).

Southern side of Aru Eilanden.—Djin eilanden.—This group, lying on the extensive drying reef southward of Workai, consists of six sandy islands, most of which are very low, and to some extent inhabited.

- 50** Kultubai-Zuid (South Kultubai), the easternmost of the group, appears at some distance from northward and southward as two islands owing to a gap in the trees. Near the western extremity, there were, in 1893, two prominent trees standing close together westward of the higher trees, but they were not visible when bearing between 203° and

Charts 942b, 2759a.

Chart 470.

338°. There are some shrubs on the reef northward of the island.

Maardjindjin (Maarjinjin), situated close westward of Kultubai-Zuid, can be identified by a distinctive tree with a V-shaped top, on the southern side. Djeudin (Jeudin), the next island westward, has, on its south-eastern side, a remarkable tree, the top of which from southward appears like a church with a square tower. Mar and Djeh (Jeh), south-westward of Djeudin, are low uninhabited islets, and are densely covered with vegetation, except the south-eastern point of Djeh, which has a few isolated trees on it. The channel between these two islands has a depth of $3\frac{1}{2}$ fathoms (6^m9) in it, and is clear of dangers in the fairway, but the tidal streams in it are strong.

Islands and dangers southward of Djin eilanden.—Karang (*Lat. 7° 01' S., Long. 134° 39' E.*), a low and uninhabited island, thickly covered with vegetation, lies about $7\frac{1}{2}$ miles south-south-westward of Maardjindjin. A 2-fathom (3^m7) patch lies about $3\frac{1}{2}$ miles east-north-eastward of Karang, and Banda rif a 3-fathom (5^m5) patch, lies about $4\frac{1}{2}$ miles northward of the island.

Enu, a low and uninhabited island, thickly covered with vegetation, lies about $8\frac{1}{2}$ miles west-south-westward of Karang. A shoal, with a least depth of $2\frac{1}{2}$ fathoms (5^m0) over it, lies about $2\frac{1}{2}$ miles south-south-westward of the south-western extremity of Enu. Between Enu and the south-eastern side of Trangan there are a number of shoals with depths of from $2\frac{1}{2}$ to 5 fathoms (4^m6 to 9^m1) over them, the positions of which may best be seen on the chart.

South-eastern side of Trangan.—Dangers.—Beacons.—The south-eastern coast of Trangan is low. Two prominent trees stand about $9\frac{1}{2}$ miles north-eastward of Tandjung Ngabordamlu (page 183), and about 4 miles farther north-eastward is Tandjung Goldjuring (Goljuring).

Close northward of Tandjung Goldjuring is the entrance to Sungei Laelaemaar, which is about $2\frac{1}{2}$ cables wide, but narrows rapidly inside. South-eastward of Tandjung Goldjuring are two reefs which dry, on each of which is a sacrificial post, consisting of a small hut on piles, standing in the water, which are good marks. The villages of Oud Krei and Nieuw Krei stand on the coast about 4 and $6\frac{1}{2}$ miles, respectively, north-eastward of Tandjung Goldjuring.

Pendjuring (Fenjuring) is a group of low islets which appear as one large island, with rocky sides and thickly covered with vegetation, lying about 7 miles north-eastward of Tandjung Goldjuring. Between the extensive drying reef which connects this island with Mar, and the Trangan coast there are two moderately deep channels which lead to Oud Krei and Nieuw Krei.

The western channel leads close under the coast of Trangan, and is very narrow. It may be navigated by eye and by constant sounding at all states of the tide. Northward of Tandjung Goldjuring, the western side of the channel should be kept, to avoid a small drying reef eastward of Kampung Biltubur, which lies about $3\frac{1}{2}$ miles south-westward of Oud Krei.

The eastern channel, although wider, presents more difficulty, and is only practicable after half ebb, when the reefs are visible. It trends in a northerly direction, passing close westward of Djeh.

Directions.—The western side of the islet, southward of Kumnaar, situated about one mile southward of Nieuw Krei, in line with the east-

Charts 942a, b, 2759a.

Chart 470

ern side of Karwai, an islet with some coconut trees on it, which lies about 3 miles southward, bearing 349° , is an excellent mark for approaching the eastern channel; if the first-named islet is not visible, then the eastern side of Karwai should be steered for on that bearing. This is not always easy, as the tidal streams, sometimes strong, do not always set in the direction of the channel, being affected by some openings in the extensive drying reef around Pendjuring.

Care is required to avoid the shoal which extends from the drying reef westward of Wolil (*Lat. $6^{\circ} 50' S.$, Long. $134^{\circ} 28' E.$*), an islet lying about 5 miles south-eastward of Karwai; there is a small one-fathom (1^m8) patch here, which is very steep-to. Having passed it a vessel can navigate by eye between Karwai and the drying reef south-south-westward of it, thence northward towards the islet lying about half a mile eastward of Oud Krei.

Chart 3244.

TIMOR.—This island, the largest of the *Kleine Sunda eilanden* (Lesser Sunda islands), is described in *Eastern Archipelago Pilot*, Vol. II. The eastern end is occupied by a fairly high, flat ridge of mountains, terminating in an almost perpendicular cliff about one mile within Ponta Sevivara, the eastern extremity of the island.

Jaco, a flat, uninhabited island 263 feet (80^m2) high, with rocky coasts, lies close off Ponta Sevivara (*Lat. $8^{\circ} 24' S.$, Long. $127^{\circ} 18' E.$*).

Straat Jaco, between Jaco and Timor, is a clear channel, with a least width of about 3 cables, and can be safely navigated by keeping in mid-channel. The tidal streams may attain a rate of 4 knots at spring tides; the direction changes regularly, but the north-going stream is of longer duration than the south-going. There are eddies in both entrances, and there is a troubled sea off the southern entrance during the South-east monsoon.

Charts 3244 and 3245.

SERMATA EILANDEN.—These islands consist of two chains extending east-north-eastward and eastward, respectively, from Straat Wetar (described in *Eastern Archipelago Pilot*, Vol. II) to approximately the meridian of $130^{\circ} E.$ The former chain consists of the Romang group and Damar eilanden. All islands are high and steep-to, and they have no known off-lying dangers.

Current.—During the period of the South-east monsoon an easterly current has been found to prevail on the northern side of Sermata eilanden.

Standard time.—See page 5.

Chart 3244.

ROMANG GROUP.—This group, consisting of several hilly islands, lies about 44 miles northward of Ponta Sevivara, the eastern extremity of Timor. The most prominent summits are those of Romang, Njata, Tellang and Maopora. The channels between Romang and the adjacent islands, and also that between Maopora and Kital are deep and clear of dangers. See views facing page 196.

Njata, the westernmost island of the group, is 1,031 feet (314^m3) high, and is fringed by a very steep-to reef, affording no anchorage.

Tidal streams.—Off Romang group the tidal streams set north-

Charts 942a, b, 2759a.

Chart 3244.

ward with the rising tide, and southward with the falling tide. In the channels between the islands the streams run at a rate of from $1\frac{1}{2}$ to $2\frac{1}{2}$ knots.

Romang.—Anchorages.—Romang is fringed by a steep-to reef, with depths of about 11 fathoms (20^m1) at its edge. There is a detached coral patch, with a depth of 29 feet (8^m8), situated about three-quarters of a mile off the northern coast, about 2 miles from the north-eastern extremity of the island. The northern coast is rocky, interspersed with sandy beaches. Good anchorages may be obtained by vessels with local knowledge in Zwaan baai, at the western end of the northern side of the island, and in the bights eastward of it. This bay can only be entered when the reefs are plainly visible; a vessel can then anchor southward of a small detached reef, which dries, in the middle of the bay, where there is sufficient room to swing with a radius of about 650 feet (198^m1).

The west coast is rocky except in the deep bight off the deserted village of Hila. Anchorage may be obtained northward of this village just northward of the rocky northern entrance point of the bight; the outermost houses of Hila should be just clear of the point, bearing 150° , and the vessel should anchor about $1\frac{1}{2}$ cables from the relatively narrow coastal reef, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), stones.

The summit of the island, 2,449 feet (746^m4) high, stands near the western side about $2\frac{3}{4}$ miles southward of the northern extremity of the island.

The southern and south-western coasts are the rocky edge of a moderately high plateau, which is separated from the higher north-eastern part by some lower land which is marshy in places. Anchorage may be obtained off the south coast, in depths of from 16 to 19 fathoms (29^m3 to 34^m7), sand and stones, off the sandy beach fronting an abandoned village, with the southern extremity of the island bearing 094° , and an isolated hut, which stands on the beach between this point and the south-western point of the island, bearing 004° .

Chart 2465, plan of Rumah Kuda bay and Nusa Mitan.

On the east coast, which is mostly steep, there is a long sandy beach in Rumahkuda baai, which continues northward as far as Kampung Djerusu (Jerusu) (*Lat. $7^\circ 35' S.$, Long. $127^\circ 28' E.$*), situated about 6 miles north-eastward of the southern extremity of the island. Good anchorage may be obtained in this bay in depths of from about 33 to 38 fathoms (60^m4 to 69^m5) with the mouth of the river bearing 315° and Kampung Rumahkuda 022° ; there is swinging space with a radius of about $1\frac{1}{2}$ cables; the shore reef is plainly marked by discoloration.

Anchorage may be obtained by vessels with local knowledge about 4 miles north-eastward of Djerusu, abreast a conspicuous hut, situated at the southern entrance of the channel between Romang and Tellang; the vessel can anchor here during the West monsoon about $1\frac{1}{2}$ cables from the coastal reef of Romang, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), with the conspicuous hut bearing 281° , and the two points northward in line. During the survey the tidal streams here attained a rate of $1\frac{1}{2}$ knots.

Mitan, 303 feet (92^m4) high, is an island covered with grey coral lime, lying about 2 miles south-eastward of the head of Rumahkuda baai.

Chart 2759a.

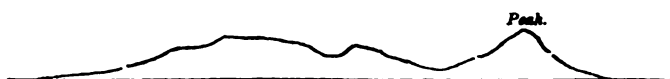
Chart 3244.

Eastern islands of Romang group.—Anchorages.—Tellang 618 feet (188^m3) high, and Lintutu lie on the same reef about 3 miles eastward of the north-eastern part of Romang; the channel between 5 Tellang and Lintutu dries.

Laut, 181 feet (55^m2) high, situated about half a mile north-north-eastward of Tellang, consists of a mass of rocks, and Kital 213 feet (64^m9) high, lying about the same distance south-eastward of Tellang, is separated from it by a deep and clear channel; it has a sandy 10 beach. During the survey, in 1923, the stream through this channel was observed to run at a maximum rate of 2½ knots. A safe anchorage may be obtained by vessels with local knowledge, in a depth of about 12 fathoms (21^m9), sand and rock, between Tellang and Kital.

Maopora, situated about 6 miles eastward of Romang, is 1,015 15 feet (309^m4) high, at its northern end. The northern coast is rocky and steep; on the coastal bank, particularly on the 6-fathom (11^m0) patch, situated about three-quarters of a mile eastward of the northern extremity, there is a convenient anchorage, but there are very strong 20 tide-rips in this vicinity. The east coast, especially towards the southern end, is marshy. Good anchorage may be obtained in the channel between Maopora and Djuha, where the depth is about 27 fathoms (49^m4). With the reefs clearly showing, this channel which is about a cable wide, is easy to navigate. There are two small islets, covered with vegetation, on the reef lying off the south-eastern end 25 of Djuha, which are easy to distinguish. The stream here during the survey, was observed to have a maximum rate of 2 knots. The west coast of Maopora consists almost entirely of fine sand beach, off which there is no anchorage.

Djuha (*Lat.* 7° 35' S., *Long.* 127° 38' E.), a sandy islet covered with 30 vegetation situated about a mile north-eastward of the eastern extremity of Maopora, is fringed by a steep-to reef.



Peak of Maopora, bearing 235°.
(Original dated 1933.)

Charts 3244, 3245.

DAMAR EILANDEN.—This group includes Damar and off-lying islets, Teun and Nila, all hilly and steep-to, the peaks being good 35 landmarks. There are no known off-lying dangers. The islands are inhabited.

Damar.—Anchorage.—This island, which lies about 60 miles east-north-eastward of Maopora, is mountainous, with spurs extending to the coast. The north-eastern peninsula is predominated by 40 Wuwarlali, 2,846 feet (867^m5) high, which has four peaks. *See view facing page 196.* At the western extremity of the island there are two regular cones, and at the southern extremity there is a peak, 1,527 feet (465^m4) high. The island is volcanic and in places steam and sulphur vapours are emitted. On the south-eastern side of 45 Wuwarlali there are some bare patches with lava. Earthquakes and disturbances of the sea occur regularly.

Good anchorage may be obtained by vessels with local knowledge

Chart 2759a.

Charts 3244, 3245

during the South-east monsoon, in Wilhelmus baai, on the north-eastern side of Damar. A vessel should approach the anchorage with the mouth of Ajer Kotta, situated on the south-western side of the bay, bearing about 235° , with the anchor lowered about 35 fathoms (64^m0) from the bows; this approach will lead clear of the shore reefs. The walls of an old fort are situated in Kampung Kumur, on the northern side of the river entrance.

Chart 3440, plan of Telok Solat or Kulewatti bay.

Telok Solat.—Anchorage.—This bay, on the eastern side of 10 Damar, is free from dangers in the fairway. On the northern shore are the villages of Solat Kehli and Solat, the latter situated on the western extremity of a tongue of land extending westward, and on the southern shore is Kampung Wulur. The shore reef, except at the head of the bay, where it mostly dries, nowhere extends more 15 than about one cable; off Solat Kehli it is marked by discoloration, but elsewhere it is not so clearly visible. There are some hot springs at Solat Kehli.

Good anchorage may be obtained during the West monsoon, in a depth of about 27 fathoms (49^m4), with the boat pier at Solat bearing 20 000° . A vessel approaching the anchorage should not get too close to the northern shore, as the stream and swell set strongly on to it.

Charts 3244 and 3245.

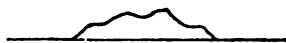
Islands southward of Damar.—Noord Terbang (*Lat.* $7^{\circ} 18' S.$, *Long.* $128^{\circ} 34' E.$), 464 feet (141^m4) high, and Zuid Terbang, 398 feet 25 (121^m3) high, lie about $2\frac{1}{4}$ miles apart, the former being situated nearly 6 miles south-westward of Tandjung Wotkuam, the southern extremity of Damar. There is sometimes a strong stream in the passage between the two island. A temporary anchorage may be obtained, in a depth of 39 fathoms (71^m3), near the southern extremity of Noord Terbang, 30 with the 1,527-foot (465^m4) peak which stands close northward of Tandjung Wotkuam, showing midway between Tandjung Watlewantutu, the south-eastern point of Damar, and the south-eastern extremity of Noord Terbang. The depths increase rapidly just outside this position. 35

Chart 3244.

Nus Leur are two islets, 149 and 96 feet (48^m4 and 29^m3) high, lying close together on a coral reef, which is too steep to for anchorage in its vicinity.

Charts 3244 and 3245.

Teun.—Anchorage.—Teun, an island, which lies 26 miles east-north-eastward of Damar, consists chiefly of a volcano, 2,147 feet (654^m4) high, with a large crater just visible from northward, but not from southward; eruptions from this volcano have been known. 40



Teun, bearing 216° , 45 miles.

(Original dated 1933.)

There are several villages on the island, the most important of which 45 is Lajoni, which stands on the south-western coast, off which a vessel with local knowledge may obtain anchorage, in a depth of 7 fathoms (12^m8), with the flagstaff in the village bearing 050° , and the northern

Charts 2759a, 1263.

Charts 3244 and 3245.

entrance point of the small bay in which the village stands, 332°. The bottom is very steep-to. The flagstaff is clearly visible, and there is a church in the village, but it is partially obscured by a large tree.

5 *Charts 3243 and 3245.*

Nila.—Anchorages.—This island, which lies about 23 miles north-eastward of Teun, is a volcano, 2,560 feet (780^m3) high, with



Nila, bearing 199°, 25 miles.

(Original dated 1933.)

steep slopes and only covered with vegetation in patches. The coast throughout is high and steep. As far as is known the only eruption
10 was in 1932, but steam, sulphur vapour and hot springs are observed regularly on the eastern side. The northern half of the island is fringed by a steep-to coastal reef which dries; a ridge with a depth of 10 feet (3^m0) over it, lies off the north-western edge. This side of the island should not be approached within a depth of about 100 fathoms (182^m9)
15 unless it is intended to anchor westward of Nika. There are some coconut plantations on this side of the island.

Chart 2465, plan of Nika anchorage.

A vessel may obtain a sheltered anchorage in an opening between the reefs westward of Nika, an islet, 154 feet (46^m9) high, lying on the
20 reef which extends about 1½ miles northward from Tandjung Keliatutnu (Lat. 6° 43' S., Long. 129° 32' E.), the north-eastern extremity of Nila. She should approach the opening with the summit of Nila bearing 190°, which leads through the middle, in a least depth of 4½ fathoms (7^m8). The least width in the entrance over the bar is about one cable, between
25 rocks which border the reefs on either side; those parts of the reefs which dry and the bottom of the channel are marked by discoloration. Allowance must be made for the tidal stream, which sets across the entrance, and it is necessary to keep in mid-channel.

Nusafnu, a small islet lying on the shore reef about three-quarters
30 of a mile westward of Tandjung Keliatutnu, is difficult to identify. The vessel should anchor with the northern extremity of Nika bearing between 095° and 090°. This anchorage can also be approached from westward, with the southern extremity of Nika bearing 093°; this channel, which is only about half a cable wide, can be navigated
35 by eye, passing about 80 yards (73^m2) northward of a small reef, which dries, situated 7 cables westward of Nika.

As upheavals of the bottom around this volcanic island may have taken place, it is advisable to send a boat in to examine the locality before entering.

40 *Charts 3243 and 3245.*

Anchorage may be obtained by vessels, with local knowledge, in depths of from 25 to 33 fathoms (45^m7 to 60^m4) with the village of Wotai, situated on the south coast, bearing 342°; it is, however, open to the wind and sea during the South-east monsoon. The bay,
45 on the northern shore of which the village stands, is encumbered with

Charts 2759a, 1263.

Charts 3243, 3245

reefs, and is too dangerous for a vessel to enter it. There is a flagstaff at the village.

Off-lying dangers.—Dusborgh rif, which dries, lies about $4\frac{1}{2}$ miles north-westward of Nila. The surf and discoloration on this atoll-shaped reef render it visible from a considerable distance.

Nil Desperandum or Griffin reef, situated about 16 miles east-north-eastward of Nila, is a sandy patch which dries about 6 feet (1^m8).

Chart 3243.

10

Eiland Serua.—Anchorages.—This island, which lies about 38 miles north-eastward of Nila, is a volcano, 2,100 feet (640^m1) high, the last known eruption took place in 1844; near the north-western extremity of the island there is a prominent knob, 798 feet (243^m2) high. The coast is fringed by a narrow reef in places, but it nowhere extends more than one cable offshore.



Serua, bearing 084°, 20 miles.

(Original dated 1883.)

Kekeh Besar, 633 feet (192^m0) high and Kekeh Ketjil lie on the same reef about 4 cables westward of Tandjung Aturin, the western extremity of Eiland Serua, with a clear and deep passage between.

Anchorage may be obtained by vessels with local knowledge in this passage, in depths of from 33 to 38 fathoms (60^m4 to 69^m5), also in depths of from 38 to 44 fathoms (69^m5), northward of a small sandy beach, situated on the north coast about 2 cables north-westward of the prominent knob; it can be identified by some sheds. This anchorage should be approached with Kampung Leshuru (Lat. 6° 18' S., Long. 130° 00' E.), situated high up on the saddle between the sheds and the summit of the island, in line with the sheds, bearing 186°, anchoring about $1\frac{1}{2}$ cables northward of the drying reef.

Chart 3244.

Kisar.—Anchorage.—This island lies about 18 miles north-north-westward of Ponta Sevivara, the eastern extremity of Timor. Tailutu, its highest peak, attains an elevation of 785 feet (239^m3). The coast which consists of coral lime, is high, steep, and rocky, broken only in places where the streams flow out; the hills in the interior are only sparsely covered with vegetation. See view facing page 197.

Indifferent anchorage may be obtained in Rede Pantai Wonréli, off the south-western side of the island, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), coral and stones, about three-quarters of a cable west-north-westward of a distinctive white pyramid; if the vessel anchors farther offshore she may drag her anchor owing to the steepness of the bottom; sudden squalls make the anchorage dangerous. The tidal streams here set north-north-eastward and south-south-westward.

The best place for landing or loading cargo is near the mouth of the Wonréli rivier, which is exposed west-south-westward, but there is

Charts 2759a, 1263.

Chart 3244.

a narrow reef, which dries, with greater depths inside it, lying about half a cable offshore, which acts as a breakwater. A shallow channel, which is available for boats at low water, leads over this reef. There are a few huts at the landing place. Boats can use the landing place between half-tide and high water.

During the West monsoon the roadstead is unsafe, and communication with the shore is interrupted.

Kampung Pantai Wonréli, situated a short distance inland, is the headquarters of a Government official; there is a large church in the village. Goats, sheep and poultry may be obtained, but there are no vegetables. The climate is healthy and there is seldom any malaria. In some years no rain falls, and during these periods the inhabitants migrate to Romang.

15 Kampung Djawallan (*Lat.* 8° 03' S., *Long.* 127° 13' E.), situated on the eastern side of the island about 3 miles from the northern end, affords a landing place in the North-west monsoon.

Lèti eilanden.—This group consists of three islands, Lèti, Moa and Lakor, the first named lying 23 miles east-south-eastward of 20 Kisar. Lèti and Moa are hilly, but Lakor is low, with trees about 160 feet (49^m8) high.

Lèti.—Anchorages.—This island is traversed by a number of ridges of rounded hills, attaining an elevation of 1,330 feet (405^m4) extending in an easterly and westerly direction. The hilly part of the 25 island is surrounded by a belt of flat land, which rises in terraces to heights of from 25 to 65 feet (7^m6 to 19^m8), and on which there are numerous coconut trees. On the southern side of the island there is a separate plain which rises steeply from the sea, where it is undermined by the action of the breakers. See view facing page 197.

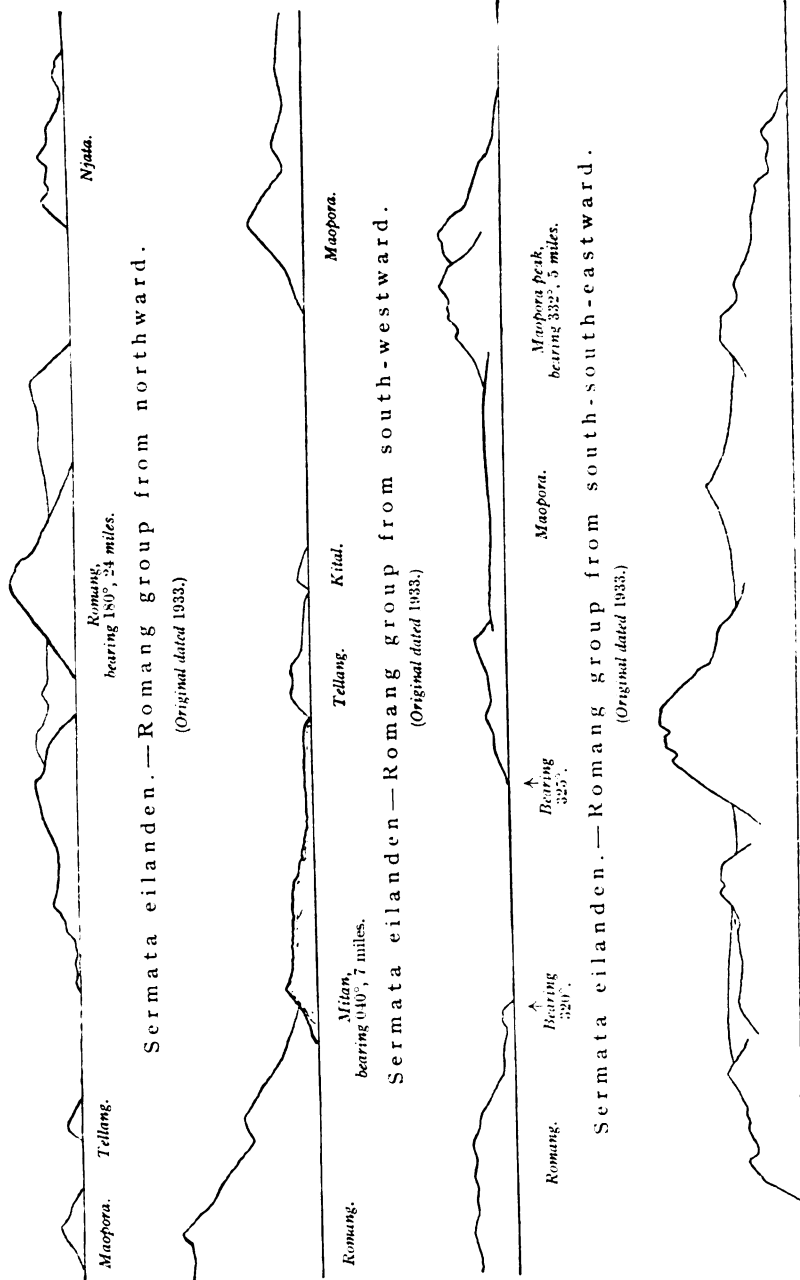
30 The best anchorage during the East monsoon is off Kampung Serwaru, situated on the northern side of the island, with Wuarlawan, the summit of the island, bearing about 180°, and the northern extremity of the island, 101°. The anchorage should be approached on the former bearing. During the North-west monsoon, the anchorage 35 is dangerous, as the holding ground is coral and stones, and is not good. Landing is difficult when there is a rough sea, and loading or unloading of boats can only take place at high water on account of a reef, which dries, fringing the coast.

There is a small bight, sheltered from westerly winds by a coral reef, 40 situated near Kampung Tutukai, a short distance east-north-eastward of Serwaru. Boats can approach it through a narrow channel in the reef by keeping two crosses on posts in line, which leads towards two sheds on the shore.

Off the village of Tombra, which stands about one mile south- 45 westward of Serwaru, there is an opening in the reef, about three-quarters of a cable wide, inside which small craft with local knowledge may obtain anchorage, in depths of from 6 to 9 fathoms (11^m0 to 16^m5), sand and mud; the reef on either side dries, and vessels can secure alongside it.

50 Small vessels with local knowledge may obtain anchorage, in depths of from 19 to 38 fathoms (34^m7 to 69^m5), near Kampung Luhulèlè, situated on the southern side of the island, about 2½ miles westward of Tanjung Supurmela (*Lat.* 8° 12' S., *Long.* 127° 45' E.), the south-eastern point, between a crescent-shaped reef, which dries, lying off the

Chart 2759a.



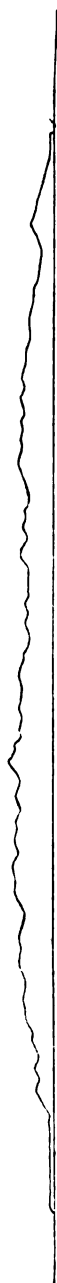
Tailutu,
bearing 356°, 15 miles.



Tandjung
Wakulideron.

Sermata eilanden.—Kisar from southward.

(Original dated 1933.)



↑
Bearing
171°.

Sermata eilanden.—Lèti from northward.

(Original dated 1933.)

Keljojar Wahan
bearing 264°, 13 miles.

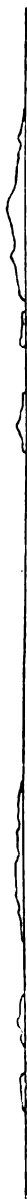


Maru.

Motu.

Northern end of Tanimbar eilanden from eastward.

(Original dated 1933.)



Wuluaru.

Sela,
bearing 149°, 20 miles.

Tanimbar eilanden from north-westward.

(Original dated 1933.)

Chart 3244.

eastern end of the village, and a sand spit westward of it extending from the sandy beach. These vessels can also obtain anchorage in the basin on the north-eastern side of the crescent-shaped reef, but the swinging room is limited. There is a least depth of 26 feet (7^m9) 5 in the entrance, which is about three-quarters of a cable wide.

The inhabitants of Lèti dwell on the flat land, principally on the coast; their villages are mostly built on raised coral reefs, which, in places, rise vertically to a height of from 30 to 40 feet (9^m1 to 12^m2). Buffaloes, goats and pigs are plentiful. In times of scarcity the 10 inhabitants migrate temporarily to Moa.

Straat Moa.—This strait, between Lèti and Moa, is free from danger. The tidal streams are strong, and when against the wind, raise a rough sea.

Moa.—Anchorages.—This island, which lies about 2½ miles 15 eastward of Lèti, consists of a coral lime plateau, from 30 to 65 feet (9^m1 to 19^m8) high, from which the land rises in the eastern and western parts. In the western part there are two prominent peaks, of which, Lkamar, the eastern, is 946 feet (288^m4) high, and covered with vegetation, and Kogotea, the western, is 723 feet 20 (220^m4) high, and bare. The eastern hilly land also has two distinctive barren peaks, of which Kuli, the western, and higher, has an elevation of 1,228 feet (374^m4). There are several villages on the island, the most important of which is Pati, on the south coast, situated about 8 miles from the western extremity of the island; in this village 25 there is a church and the remains of a blockhouse. The island is very fertile.

There are no safe anchorages except during the periods of the transition of the monsoons and at the beginning of the East monsoon. Anchorage may, however, be obtained, in a depth of about 19 fathoms 30 (34^m7), off Kampung Kaiwatu, which stands on the north coast, about 3 miles from the western extremity of the island, with Kuli in line with a small rocky point, bearing 111°, and a flagstaff, 223°. Inland of the village, standing on higher ground and westward of the flagstaff, is a distinctive white building. The tidal streams at this anchorage 35 frequently change their direction and at times attain a rate of one knot.

Anchorage may be obtained in considerable depths off Pati, but the sea is usually too heavy. About 5½ miles eastward of Pati is Kampung Klis, off which a vessel might obtain temporary anchorage with the village flagstaff bearing 047°, and Tandjung Tut Nei, situated about 40 5 miles westward of Tandjung Supur, the south-eastern extremity of the island, 151°.

During the transition period of the monsoons a vessel can anchor in most places off the southern side of the south-eastern end of Moa, about one cable from the drying coastal reef, in depths of from 19 to 45 25 fathoms (34^m7 to 45^m7), sand. The tidal streams attain a rate of from 2 to 3 knots along this coast.

Straat Lakor.—This strait, between the eastern end of Moa and Lakor, has a least width of about one mile and is clear of dangers. Off Moanga, on the east coast of Moa, situated about 3 miles north-north- 50 eastward of Tandjung Supur (*Lat.* 8° 16' S., *Long.* 128° 03' E.), and off the north-western point of Lakor there are often eddies and heavy tide-rips, the streams frequently attaining a rate of 4 knots or even more.

Chart 2759a.

Chart 3244.

Lakor.—The coast of this island is mostly rocky, interspersed by sandy beaches in some places, such as at the low north-western point. There are several villages on the island. Kampung Warwawang, situated in the middle of the northern coast, stands on a high rock, and is prominent.

Charts 3244 and 3245.

Babar eilanden.—The principal islands of this group are Meatij Miarang, Sermata and Babar. All the islands and islets are hilly with the exception of Meatij Miarang, and all can be closely approached.

Meatij Miarang.—**Light.**—**Buoys.**—**Anchorage.**—This island, densely covered with vegetation is situated about 16 miles east-south-eastward of Tandjung Njadora, the eastern extremity of Lakor, and lies near the south-eastern extremity of an extensive reef which dries. On the north-western end of the reef are Amortaun and Meaterialam, low islets, thickly covered with vegetation, and on the western extremity of the latter there is a tree which shows up well. The outer edge of the reef is steep-to, and there is no anchorage outside it.

A light (*Lat. 8° 20' S., Long. 128° 30' E.*), is exhibited, at an elevation of 76 feet (23^m2), from a white iron framework structure, 75 feet (22^m9) in height, situated on the western side of Meatij Miarang.

About half a mile westward of the south-western extremity of Meatij Miarang is Morau, a low islet, and close off the south-eastern end are two rocky islets.

Within the reef, and extending nearly its entire length, is a lagoon, with two channels, about three-quarters of a cable wide, leading into it on its eastern side; in the northern channel there is a depth of 23 feet (7^m0), and in the fairway of the southern channel, 3 fathoms (5^m5), but there is a 14-foot (4^m3) patch on the south-eastern side. The entrance to the southern channel is marked by a white conical buoy on the north-western side and a black can buoy on the south-eastern side. The tidal streams in the channels may be strong.

Anchorage may be obtained by vessels with local knowledge in the southern part of the lagoon, by entering through the southern channel, steering 222°.

There is a small village on the island, situated northward of the light-structure, it can only be reached by boats at high water.

Luang and Kalapa.—**Anchorage.**—These islets, situated about 14 and 18 miles respectively, north-eastward of Meatij Miarang, lie, together with several smaller islets, on an extensive reef, which partly dries. Luang has two peaks, the higher of which has an elevation 851 feet (259^m4) and is almost barren. Kalapa, the easternmost of the group, is mostly low, but is covered with high vegetation. Lailawan and Metutun are low islets situated on the eastern end of the reef, they are important landmarks; there are some coconut trees on Metutun, but Lailawan is a bare sandy patch.

There is an anchorage, named Moōra, for small vessels with local knowledge off the western extremity of the reef. Boats can pass over the reef on the northern side of Luang, where there is a depth of about 3 feet (0^m9) at high water, into a basin with a depth of 5 fathoms (9^m1) in it, sand.

Sermata.—**Anchorage.**—This island, which lies about 1½ miles eastward of Kalapa (*Lat. 8° 11' S., Long. 128° 47' E.*), is traversed

Chart 2759a.

Charts 3244 and 3245.

by rounded hills mostly covered with reeds, and on its eastern extremity are four outstanding limestone terraces, attaining an elevation of about 650 feet (198^m1). About 1½ miles from this end of the island there are some noticeable trees on a mountain, 1,222 feet (372^m5) high, covered with reeds. The highest point of the eastern end of the island is 1,284 feet (391^m4) high and is situated about 1½ miles north-westward of the trees, mentioned above, the highest point of the western end is 1,212 feet (369^m4) high and stands about a mile eastward of the western extremity of the island. 5 10

Baai van Lèlang, situated on the southern side of the island, affords shelter to vessels with local knowledge, during the transition periods of the monsoons and during the West monsoon, but the bottom is steep, and sudden squalls during this monsoon sometimes render the anchorage unsafe. 15

There are a number of villages on the island surrounded by high stone walls. 15

Chart 3245.

Babar and Wetan.—Babar, situated 39 miles east-north-eastward of Sermata, is 2,708 feet (825^m4) high near its centre, with a ridge descending steeply to its north-eastern extremity. The water from its rivers often causes discoloration around the island for a considerable distance seaward. 20

Wetan is 1,143 feet (348^m4) high at its southern end, and 447 feet (136^m2) at its northern end, with a coral lime terrace between. 25

Chart 2465, plan of Wetan strait.

Straat Wetan.—**Anchorage.**—**Light.**—Straat Wetan, which separates the western side of Babar from Wetan, is deep in the fairway and has a least width of about one mile. A shoal, with a depth of 3½ fathoms (6^m9) over it, lies about half a mile off the south-eastern side of Wetan, about 2½ miles north-eastward of the southern extremity of the island. (*Lat.* 7° 56' S., *Long.* 129° 34' E.). 30

Anchorage may be obtained in Rede Herlei, situated on the western side of the strait, in a depth of about 27 fathoms (49^m4), off a sandy beach. A vessel may lie here in moderate safety, although the swell at times is troublesome. 35

Chart 2465, plan of Tepa road.

Rede Tepa, on the eastern side of Straat Wetan at its northern end, affords a safe anchorage during the East monsoon. With north-westerly winds there is sometimes a considerable sea and surf on the coast, but there is no danger of dragging unless the wind blows hard. During the West monsoon, however, it is better to anchor in Rede Herlei. 40

A light is exhibited, at an elevation of 16 feet (4^m9), from a wooden mast, 26 feet (7^m9) in height, on the beach at the village of Tepa.

A reef, with a depth of one fathom (1^m8) over it, lies about 2½ cables north-westward of the light-structure. 45

A vessel should approach the anchorage with the flagstaff, situated close to the light-structure, bearing 090°, and anchor in the required depth. Allowance should be made for the tidal stream, which sets northward and southward. When nearing the roadstead, the depths decrease suddenly. It is recommended to lower the anchor with about 27 fathoms (49^m4) of cable from the bows, and to approach as slowly as possible; during the West monsoon, 44 fathoms (80^m5) of cable should be veered out. If, during this monsoon, it is not possible for 50

Chart 2465, plan of Tapa road.

the vessel to discharge her cargo in Rede Tapa, a blue flag is displayed and she should proceed to Herlei.

The best landing place is in a small creek northward of the village where there is a sandy beach. Tapa (*Lat. 7° 52' S., Long. 129° 36' E.*) is the headquarters of a Government official.

Chart 3245.

Anchorage off Babar.—Shoal.—Anchorage may be obtained anywhere off the south-western side of Babar, taking care to avoid the 10 16-foot (4^m9) patch situated about 1½ miles offshore, about 5½ miles west-north-westward of the southern extremity of the island; this patch is steep-to and is seldom marked by discoloration. The coastal reef is narrow and steep-to everywhere, and the bottom is rocky. A vessel should approach slowly with the anchor lowered about 38 15 fathoms (69^m5) from the bow.

Anchorage may also be obtained off the southern and eastern coasts of the island, except in the bay northward of the eastern extremity. The reefs off the east coast, with depths of from 16 to 26 feet (4^m9 to 7^m9), lying between Kampung Wakpapapi and Ahanari, situated 20 about 3 and 5 miles, respectively, south-south-westward of the eastern extremity of the island, are not marked by discoloration, but the reef, with a least depth of 23 feet (6^m9) over it, lying about 3½ cables off the eastern extremity of the island, is so marked; the passage between this reef and the coast is clear of dangers.

25 With easterly winds a vessel will lie in safety off Kampung Jatoke, situated about 4 miles northward of Kampung Letwurung, which stands on the eastern extremity of the island, in a depth of about 36 fathoms (65^m8), close to the coastal reef. For about 4½ miles westward of this anchorage the depths decrease too steeply as the coast is 30 approached to obtain anchorage; thence to abreast Kampung Manuwui, situated about 7 miles farther westward, anchorage may be obtained anywhere. A vessel should approach with her anchor lowered about 30 fathoms (54^m9) from the bow.

Masela.—Anchorage.—This island, 651 feet (198^m4) high, which 35 lies about 7 miles south-eastward of Babar, affords anchorage anywhere close offshore, in depths of from 33 to 38 fathoms (60^m5). The coastal reef is plainly marked by discoloration, as are also the detached patches, with depths of less than 5 fathoms (9^m1) over them, off the western side of the island; those off the east coast are not so marked. 40 When the reef can be plainly seen by discoloration a vessel can obtain an anchorage in the bight in the coastal reef off Kampung Telalora, which stands on the south-eastern side of the island about 1½ miles from the southern extremity, but with easterly winds there is too much sea in the entrance.

45 Charts 2465, plan of Strait between Dawera and Dawelor, 3245.

Dawera and Dawelor.—Anchorages.—These islands lie about one mile apart, about 11 miles north-eastward of Babar. Dawera, the north-western island, is 1,094 feet (333^m5) high, and Dawelor, 959 feet (292^m3). The passage between them is bordered by reefs on 50 either side, and in the middle there is a reef, with a depth of 1½ fathoms (3^m2) over it, all of which are marked by discoloration. Several patches, with depths of from 2½ to 5½ fathoms (5^m0 to 10^m1) over them lie about half a mile southward of Dawera and within about 6 cables of the western extremity of Dawelor.

Charts 942a, b, 2759a.

Charts 2465, plan of Strait between Dawera and Dawelor, 3245.

A well-sheltered anchorage may be obtained by vessels with local knowledge in depths of from 27 to 33 fathoms (49^m4 to 60^m4), during the South-east monsoon, westward of Kampung Ilmarang (*Lat.* 7° 44' S., *Long.* 130° 00' E.), situated on the south-western side of 5 Dawera. There is no difficulty with good visibility in entering the bight in the reef which is formed by a tongue of reef extending westward from the south-western point of the island, as it is marked by discoloration. Anchorage may also be obtained by vessels with local knowledge off Kampung Watuwai, which stands on the western 10 side of Dawelor, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), sheltered by a tongue of reef extending from the island, which is marked by discoloration.

Chart 3245.

Dai.—Anchorage.—This island, which lies about 13 miles north- 15 ward of Babar, is 2,134 feet (650^m4) high at its eastern end. The only anchorage is off Kampung Léwa, situated on the northern side of the island, very close to the coastal reef. A vessel approaching this anchorage should lower her anchor with about 38 fathoms (69^m5) of cable out. Strong and sudden squalls from various directions render 20 this anchorage unsafe during the South-east monsoon and even during the transition periods.

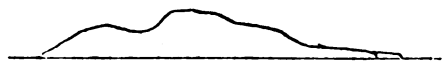
TANIMBAR EILANDEN.—These islands lie at the eastern end of the chain of islands extending from Timor towards the Aru eilanden. Jamdena is the principal island, and except on Molu and 25 Karata, all the inhabitants are Christians. With the exception of Molu, Maru, Fordate, and Laibobar and the larger islands off the west coast of Jamdena, the Tanimbar eilanden are low and flat.

Jamdena is hilly in the southern part, northward and westward of Baai van Saumlaki, but there are no outstanding peaks; there are 30 also a few hills near the east coast. There are numerous coconut plantations.

The coastal reefs provide large quantities of trepang and mother-of-pearl shell; timber is abundant in the forests, and in the interior of Jamdena are some untouched oil-fields. Outside the inhabited parts 35 of Jamdena wild buffaloes are plentiful and in the surrounding sea fish and turtle abound.

Off the west coast of Jamdena and Selaru, and in Straat Egeron the reefs show very slight discoloration, in consequence of which a vessel should be accurately fixed by the land, and not navigated by eye. 40

Islands northward of Jamdena.—Anchorages.—Molu and Maru lie at the northern end of the group, Melwuar Niwejar, 897 feet (273^m4) high, situated at the northern end of Molu, is the highest peak, *see view facing page 197*, and Keljobar Wahan, 644 feet (196^m3) high, lies near the southern end of the same island. Lubwaän, 877 45 feet (267^m3) high, is the summit of Maru, and is very prominent.



Molu, bearing 328°, 15 miles.

(Original dated 1933.)

Chart 2759a.

Chart 3245.

Maru, bearing 300°, 10 miles.

(Original dated 1933.)

The channel between Molu and Kalbur, an uninhabited islet lying northward of it, is clear of dangers. There is sometimes a heavy sea in this passage.

- 5 The country round Telok Loka and the west coast of Maru alone are inhabited; the scattered villages are connected by paths. In parts of Molu, and on the uninhabited parts of Maru, are coconut plantations. The coastal reef, stretching far out from the south-western point of Maru, is thronged in fine weather by trepang fishers from
- 10 Molu.

There is good anchorage for vessels with local knowledge off Kampung Adodo, situated on the north-west coast of Molu, in a depth of 22 fathoms (40^m2), about 5½ cables north-westward of the village.

- 15 Anchorage may be obtained by vessels with local knowledge in Telok Loka, situated on the eastern side of Molu, in the West monsoon. The reef extending from Kampung Kilun (Lat. 6° 43' S., Long. 131° 36' E.) is marked by discoloration and shows up well.

- 20 There is good anchorage everywhere off the east coast of Maru, in depths of from 22 to 27 fathoms (40^m2 to 49^m4), except off the coconut plantation on the south-eastern point.

- The channel between Maru and Wajangan is clear and deep, and is the most convenient route for vessels bound for Ritabel (page 207) from north-westward, especially when the South-east monsoon is well set in, as it sometimes blows very hard in these parts. After
- 25 passing through this passage, shelter is also afforded by Fordate and Larat; there are strong tide-rips in this vicinity when the wind is against the tidal stream.

- Nus Lima (Lat. 6° 59' S., Long. 131° 35' E.), is a group of islets and reefs, lying about 5 miles south-eastward of Maru. The reef
- 30 which surrounds these islets is well marked by discoloration, but the shoals are not. The group is uninhabited, except Wermatan, the westernmost islet, on which there are a few temporary huts near the coconut groves.

- The passage between Wermatan and Kjabrengan which lies about
- 35 1½ miles north-westward, should be avoided.

- Frinun, situated about 3¾ miles southward of Wermatan, is a low and thinly wooded islet surrounded by a reef, on the northern end of which there is a remarkable rock. Farnusan is an islet lying on a reef about 5½ miles east-south-eastward of Frinun; this reef and also the
- 40 reef extending from the northern extremity of Jamdena, which lies about 1½ miles southward, are well marked by discoloration.

A 19-foot (5^m8) coral patch lies near the fairway of the channel between Frinun and Farnusan and about 1¼ miles south-south-eastward of Frinun.

- 45 **Western side of Jamdena.—Off-lying islands.—Anchorage.**—Namwaän and Itain, 493 and 418 (150^m4 and 127^m4) high, respectively, lie about 4½ miles north-westward of the northern end of Jamdena. They are being gradually cleared for coconut plantations,

Chart 2759a.

Chart 3245.

and, in consequence, their appearance is continually changing. The channel between the two islands is clear of dangers in the fairway, but it should only be used when the reefs on either side are visible.

Depths of 6 fathoms (11^m0), or less, extend for over a mile westward 5 and south-westward of the southern extremity of Namwaän, and depths of 10 fathoms (18^m3), or less, extend about 2 miles farther south-westward.

Vatvurat eilandje lies eastward of the channel just referred to, with a clear passage between. There are two small rocks above water, lying 10 off the southern end of the islet, the northern of which bears a striking resemblance to the Madonna and Infant.

Two reefs, over each of which there is a depth of 3 feet (0^m9), lie 1½ and 2 miles, respectively, north-eastward of Vatvurat, and are well marked by discoloration. 15

Temar, situated 1½ miles southward of Namwaän, is a low, wooded coral islet covered with vegetation; the reef fringing it does not show well.

Kabawa and Karata are high, outstanding islets lying between the eastern side of Namwaän and the coast of Jamdena. Mitak, an island 20 on which there is a coconut plantation, lies about 1½ miles off the north-western coast of Jamdena; the passage between is encumbered with rocks. There is a landing stage for small craft on the southern side of the island.

Laibobar, 1,281 feet (390^m5) high, and densely covered with 25 vegetation, is the highest peak in the Tanimbar group; it stands about 4½ miles south-south-westward of Namwaän.

Good anchorage may be obtained by vessels with local knowledge on the southern side of the island, in a bay in which the coastal reef is marked by discoloration. There is no difficulty in entering this bay, 30 or in passing through the channel between Ungar and Laibobar, in which there is a depth of 26 feet (7^m9).

A reef, with a depth of 15 feet (4^m6) over it, lies about 1½ miles eastward of Tandjung Somorwahan (*Lat. 7° 12' S., Long. 131° 24' E.*), the northern extremity of Laibobar; it is not marked by discoloration. 35

Bolu, an islet lying close off the coast of Jamdena, about 1½ miles southward of Mitak, is low and covered with vegetation. Ungar and Vulmali, lying within 3 miles southward of Laibobar, are also densely covered with vegetation. A reef, with rocks above water on it, lies about half a mile east-north-eastward of Vulmali; it is not well 40 marked by discoloration, but it can be avoided by keeping close to the reef extending from the southern side of Ungar.

Shoals, with depths of 11, 23 and 26 feet (3^m4, 7^m0, and 7^m9) over them, lie about three-quarters of a mile north-north-westward, 1½ miles north-westward and one mile westward, respectively, of the 45 northern extremity of Vulmali.

Straat Jamdena.—Caution.—Dangers.—Anchorages.—Straat Jamdena lies between the western side of Jamdena and the islands westward of it. It is easy to navigate. Discoloured water, which often occurs in deep water, does not always indicate the presence of 50 reefs or shoal water, it is frequently seen in this and the adjacent channels; it is more noticeable during bright, but cloudy weather, being caused by the shadows of the clouds, and by mud stirred up by the current.

Chart 2759a.

Chart 3245.

Wotap, lying at the northern entrance of the channel, is 618 feet (188^m₄) high; there are two small bays on its western side, which afford good anchorage to vessels with local knowledge. See view facing this page. For Straat Wotap, see page 205.

Wuliaru, which lies about 4 miles south-westward of Wotap, is 615 feet (187^m₄) high near the middle. See view facing page 197. There are many off-lying dangers, but they are mostly marked by discoloration.

10 Selu, separated from Wuliaru by Straat Nulen, has two prominent peaks at its western end, Amat Jawah, 690 feet (210^m₃), and Wuru Wuru, 677 feet (206^m₃) high. Off the north-western point of the island is Nitu eilandje, 247 feet (75^m₃) high, which is a good mark. Off this islet and also off Tandjung Metanuan, the south-western point of the island, there are, at times, strong tide-rips, which raise a heavy sea. See views facing this page.

Keswu, 339 feet (103^m₃) high, lies about midway between Wuliaru and Jamdena; it is separated from Wolas, an islet eastward of it, by a narrow, deep channel, clear of dangers. Close eastward of Wolas there are a number of reefs, some of which dry and form sandbanks. The passage between these reefs and the coast of Jamdena, and that between Keswu and a reef situated about 1½ miles west-north-westward of its north-western extremity, are clear of dangers.

The last mentioned reef lies on a bank, with depths of 3 fathoms (5^m₅), or less, over it, extending about 3 miles eastward from the southern extremity of Wuliaru.

A reef, which dries, situated about 1½ miles from the eastern side of Wuliaru, which lies about 3½ miles northward of Wolas, is almost always marked by discoloration. Nus Taram are three remarkable islets lying on the mudbank extending from the western side of Jamdena, situated about 4½ miles north-eastward of Wolas. Two detached reefs, which dry, lie about 4½ and 5 miles west-south-westward of the south-western extremity of Keswu, and a 6-foot (1^m₈) patch lies about 6 miles westward of the same point.

35 *Chart 2465, plan of Wailutu road.*

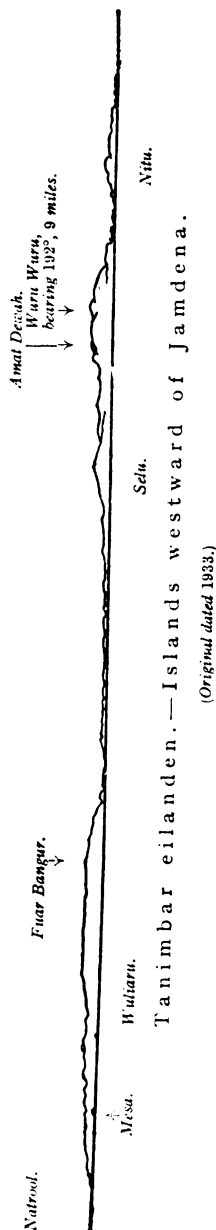
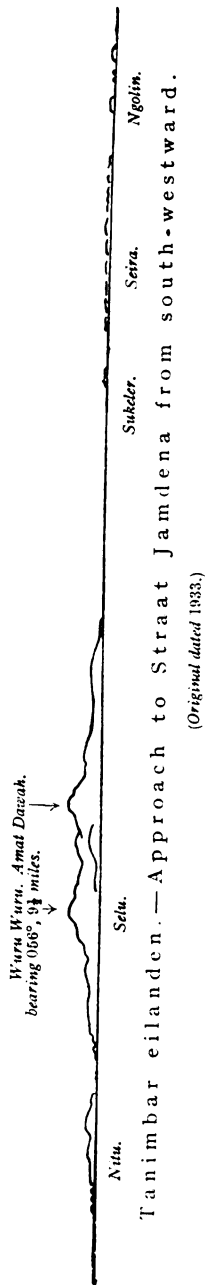
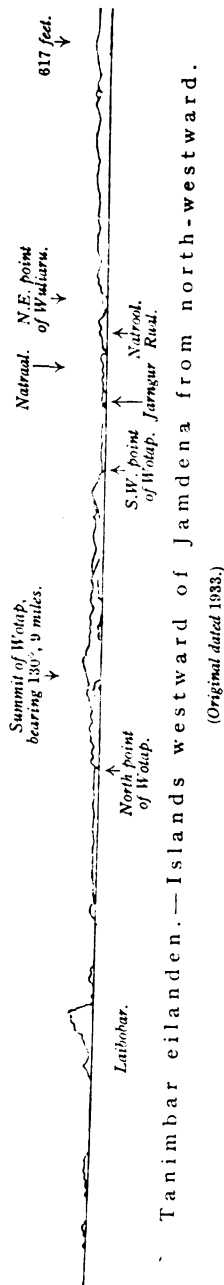
Sukeler, an island in the southern entrance of Straat Jamdena, which lies about 12½ miles south-westward of Keswu, is an excellent mark. See view facing this page. Lengwati, an islet, lies on the edge of the reef which extends about three-quarters of a mile from the south-western side of Sukeler. A 4½-fathom (7^m₈) patch lies about 3½ miles west-south-westward of Sukeler.

Chart 3245

Seira is separated from the western side of Jamdena by the narrow shallow channel, Pintu Tandula, which is frequently used by praus. The reefs and shoals southward of Seira are only slightly marked by discoloration. Baai van Salwassa is a muddy inlet extending into the western side of Jamdena eastward of Seira; it has not been closely examined and its depths are liable to change. Kampung Salwassa stands on the southern side of the inlet, and Salwassa rivier flows into the head. Ngolin, an islet lying on the reef which extends about 4½ miles south-south-westward from the south-western end of Seira, is fairly outstanding, its northern half being thickly, and its southern half very sparsely, covered with vegetation.

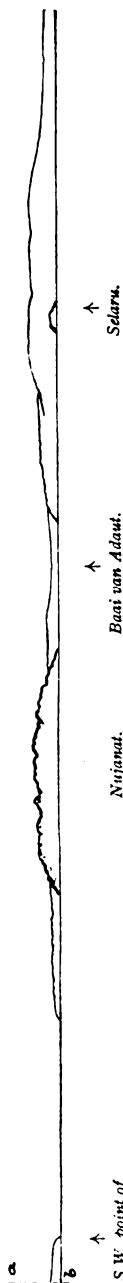
Bara Sadi (*Lat.* 7° 48' S., *Long.* 130° 48' E.), a reef which dries,

Chart 2759a.





Anguarmasa.



*S.W. point of
Matkus.*

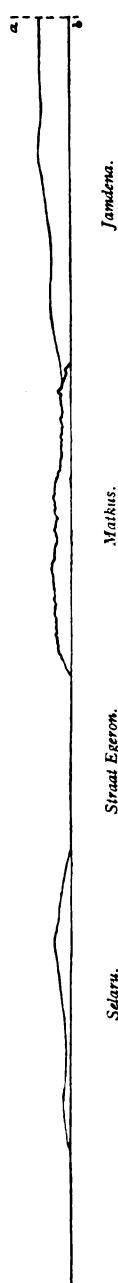
Nuijanut.

Baat van Adaut.

Selaru.

Tanimbar eilanden.—View, in two parts, of Straat Egeron from westward.

(Original dated 1933.)



Selaru.

Straat Egeron.

Matkus.

Jamdena.



Asiduban.

Tanimbar eilanden.—View, in two parts, of Straat Egeron from north-eastward.

(Original dated 1933.)

Chart 3245.

situated about 10 miles south-westward of the south-western extremity of Seira, is generally visible from a considerable distance on account of the sea breaking over it.

Two 33-foot (10^m1) patches lie about 8½ miles south-eastward 5 and 6½ miles south-south-eastward of the eastern extremity of Bara Sadi; two 6-fathom (11^m0) patches lie about 5½ and 7½ miles southward of the same point.

A depth of 45 feet (13^m7), with deep water around, lies about 9 miles southward of Bara Sadi. 10

Tidal streams.—Along the southern side of Selu, the tidal stream sets generally southward with the rising tide and northward during the falling tide, at a maximum rate of 2 knots, but a definite time when the streams turn is not known. In Straat Jamdena, during July, August, and the beginning of September, the maximum rate 15 does not exceed one knot. As the stream slackens, the discoloration of the water increases.

Straat Wotap.—This strait, which separates Wotap from Wuliaru, is a convenient passage for entering Straat Jamdena from westward. Jarngur Rual and Jarngur Raa are two sandbanks, covered with 20 vegetation, lying on separate drying reefs, situated near the middle of the strait, with a passage on either side.

Natrool eilandje, 234 feet (71^m3) high, and Natraal eilandje, 169 feet (51^m5) high, situated about 1½ miles south-eastward of it, lie on the southern side of the strait. (*Lat. 7° 25' S., Long. 131° 12' E.*). 25

Directions.—The channel, northward of the two sandbanks referred to above, is recommended, but that southward of them may also be used. Approaching from westward, after sighting the south-western point of Wotap, a vessel should keep Jarngur Raa, bearing 132°, until the remarkable rocky point with a rock lying off it, situated 30 about one mile south-eastward of the 305-foot (93^m0) hill on the south-western point of Wotap, bears 013°; she should then steer 102° (Jarngur Rual will then be well open westward of Natrool), until the eastern edge of Jarngur Raa is in line with the summit of Natraal, bearing 218°, when she should steer 131°, bringing the rocky point, 35 referred to above, almost right astern, which will lead clear into Straat Jamdena.

If proceeding through the southern channel, she should keep the southern extremities of Jarngur Raa and Jarngur Rual in line, bearing 097°, until the western extremity of Natrool is in line with the eastern 40 extremity of Wuliaru, bearing 194°, when she should steer 127°, until the western extremity of Natraal is in line with the eastern extremity of Wolas, bearing 196°, and then steer an easterly course into Straat Jamdena.

When the reefs can be distinguished, both of these passages may 45 easily be navigated by eye. The relatively large reef lying about 3 cables south-eastward of the remarkable rocky point with the off-lying rock in the northern channel referred to above, can almost always be distinguished on account of its discoloration, and besides, 50 it partly dries.

Tidal streams.—The tidal streams in Straat Wotap set in the direction of the channel at a maximum rate of about one knot.

Chart 2465, plan of Egeron strait.

Straat Egeron.—This strait, separating Selaru from the southern

Chart 2759a.

Chart 2465, plan of Egeron Strait

end of Jamdena, presents no difficulties. Anggarmasa (Anger Masa) and Matkus, are two islands lying near the middle. See views facing pages 205 and 208. On the latter there is a coconut plantation, and 5 owing to the felling of the trees, the aspect of the island is continually changing; the island has two low hills. Vessels proceeding from Saumlaki to Adaüt should pass between Matkus (*Lat.* $8^{\circ} 04' S.$, *Long.* $131^{\circ} 13' E.$) and Battjawat (Tikus), situated about $1\frac{1}{4}$ miles north-westward. Nustabun (Nusa Tabor), an islet, lies $1\frac{1}{4}$ miles north- 10 westward of the northern extremity of Matkus; a ridge, with a depth of $3\frac{1}{4}$ fathoms (5^m9) over it, which is seldom marked by discoloration, extends about half a mile northward from the islet.

Rede Saumlaki.—Light.—This roadstead lies on the eastern side of Baai van Saumlaki, between the parallels of $7^{\circ} 58' S.$ and 15 $8^{\circ} 00' S.$, and is entered from the northern side of Straat Egeron at its eastern end. It affords a secure anchorage at all times. The zinc roof of the Roman Catholic mission house is a good mark on which to approach.

Saumlaki is the headquarters of a Government official. Fresh water can be obtained from a pipe laid on to the head of the stone 20 pier, on the eastern side of the bay; there is a depth of $2\frac{1}{4}$ fathoms (5^m0) alongside the pier head. Saumlaki is connected to the general telegraph system.

A light is occasionally exhibited, at an elevation of 13 feet (4^m0), from a post on the head of the pier.

25 **Rainfall.**—See page 27.

Chart 3245.

Selaru.—Dangers.—Anchorages.—This island, the northern coast of which forms the southern side of Straat Egeron, is low; only at its south-western end is there a range of hills attaining an elevation 30 of 236 feet (71^m9); there are, however, some lower hills close within Tandjung Wadatutu, the north-western point of the island.

Chart 2465, plan of Egeron strait.

Rede Adaüt, on the northern side of Selaru, affords a safe anchorage close off the pier, situated on the eastern side of the inlet near the 35 entrance, at all times. A shed with a zinc roof on the head of the pier is a good mark to use when anchoring. A shaol, with a depth of $4\frac{1}{4}$ fathoms (7^m8) over it, lies in the north-western approach to the roadstead about a mile south-eastward of Nujanat.

Chart 3245.

40 Labuan Olendir and Labuan Lemian, on the north-western and western sides, respectively, of Selaru, afford convenient anchorages to vessels with local knowledge. With south-westerly and westerly winds, good shelter may be obtained off Kampung Namtabung, situated on the southern side of Labuan Olendir, eastward of the reef 45 extending from Tandjung Wadatutu; the coastal reef here is well marked by discoloration.

A 26-foot (7^m9) patch and a 29-foot (8^m8) patch lie in the western approach to Labuan Olendir about $7\frac{1}{4}$ and 9 miles, respectively, west-north-westward of Tandjung Wadatutu; another 29-foot (8^m8) 50 patch lies about $9\frac{1}{2}$ miles westward of the same point.

A 29-foot (8^m8) coral patch lies about $8\frac{1}{4}$ miles west-south-westward of Tandjung Aro Usu, the south-western point of Selaru.

A 33-foot (10^m1) patch lies about 3 miles eastward of the south-eastern extremity of Selaru.

Chart 2759a.

Chart 3245.

Two 29-foot (8^m8) patches lie about 10 miles eastward and 13½ miles east-north-eastward of the south-eastern extremity of Selaru.

A ridge, with depths of from 29 to 52 feet (8^m8 to 15^m9) over it, extends parallel with the south-eastern side of Selaru between positions 5 situated about 6 miles south-south-eastward and 10 miles south-south-westward of the north-eastern extremity of the island.

Directions.—A vessel approaching from eastward, after passing the southern end of Selaru, should round the south-western point of that island at a distance of one mile, and then, if proceeding north-westward, 10 steer to pass close southward of Riama, a low islet thickly covered with vegetation, situated about 5½ miles north-westward of Tandjung Aro Usu; this will avoid the 33-foot (10^m1) patch which lies about 3 miles south-westward of Riama. The passage between Riama and the south-western coast of Selaru is clear of dangers. 15

Eastern side of Jamdena.—Off-lying islands.—Anchorages.—Larat, an island separated from the north-eastern side of Jamdena by a narrow channel, is low and covered with vegetation. See view facing page 208. Vatsori (*Lat.* 7° 07' S., *Long.* 131° 46' E.), a rock lying on the coastal reef on the northern side of Larat near its western 20 end, resembles a large prau without any masts when seen from a distance westward. A wreck, lying on the edge of the coastal reef off the southern extremity of the island, is plainly visible.

The passage between the prominent rock Vatulmaa, which stands on the edge of the coastal reef on the southern side of Larat, situated 25 about 3 miles north-westward of its southern extremity, and Sari Karmut, a reef lying about 1½ miles south-westward of the rock, is clear of dangers.

Anchorage may be obtained during the North-west monsoon by vessels with local knowledge off several of the villages between 30 Watmuri (page 209) and Tumber situated about 33 miles southward. *Chart 2465, plan of Ritabel bay.*

Rede Ritabel and approaches.—Light.—Beacons.—Anchorage.—Rede Ritabel is situated between the western side of Larat and 35 Lutur, a flat island lying about 3½ cables westward. The limits of the roadstead are an imaginary line drawn from Vat momal (Watmomal) a prominent rocky islet lying close off the northern extremity of Lutur, to a point on the north-western side of Larat, situated about three-quarters of a mile north-north-eastward, and the parallel of 7° 09' 23" S. See view facing page 208. 40

On Farnusan, an islet lying about 4 miles north-westward of Lutur, there are some temporary dwellings and a coconut plantation. Meti Rottan rif, which is well marked by discoloration, lies about midway between Farnusan and Lutur.

A light is occasionally exhibited, at an elevation of 13 feet (4^m0), 45 from a post on the pier-head at Ritabel.

A white beacon stands on the edge of the reef extending northward from the north-eastern end of Lutur, and marks the western side of the channel leading to Ritabel.

A black beacon, surmounted by a truncated cone, stands on the 50 edge of the reef extending north-westward from Kampung Watidal, situated on a hill on the north-western side of Larat, about 1½ miles north-north-eastward of the light-structure, and marks the eastern side of the same channel.

Chart 2759a.

Chart 2465, plan of Ritabel bay

Kampung Ritabel stands on the western extremity of Larat, and Kampung Lelingluan on the eastern side of Lutur. Good anchorage may be obtained, in depths of from $6\frac{1}{2}$ to 11 fathoms (11^m9 to 20^m1), 5 mud, about midway between these villages. There is no swell at the anchorage except with strong northerly winds.

Ritabel is the headquarters of a Government official.

The southern approach to Ritabel, between Larat and Jamdena,⁹ is only navigable by small craft with local knowledge. There is a least 10 depth of about 2 feet (0^m6) in the fairway.

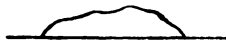
Chart 3245.

Fordate.—Anchorage.—This island, separated from the north-eastern side of Larat, by Straat Orafruan, is hilly and has several well defined peaks, *see* view facing this page. Only on the west and 15 south coasts are there any villages. Aweër, situated on the north-western side of the island, can be identified by its church.

Straat Orafruan is clear of dangers in the fairway, and the shore reefs on either side are well marked by discoloration.

Anchorage may be obtained almost anywhere off the eastern and 20 western coasts, by vessels with local knowledge, in a depth of about 27 fathoms (49^m4), except off the rocky parts southward of the villages of Adodu and Sofianin, situated in the middle of the west coast.

Schildpad eiland or Nu ka ha (*Lat. $7^{\circ} 04' S.$, Long. $132^{\circ} 00' E.$*), 25 126 feet (38^m4) high, and thickly covered with vegetation, lies on the



Schildpad eiland, bearing 080° , 7 miles.

(Original dated 1933.)

western extremity of an extensive reef, well marked by discoloration, situated about $4\frac{1}{2}$ miles eastward of the southern extremity of Fordate.

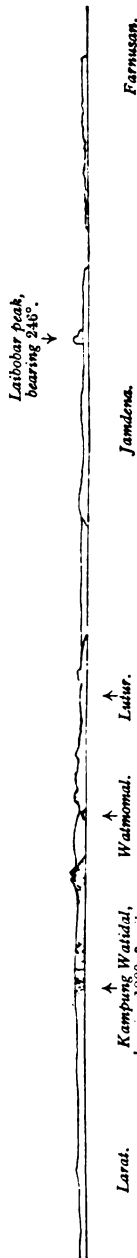
Two shoals, with depths of less than 26 feet (7^m9) over them, were reported, in 1949, to lie on a reef and within a radius of $1\frac{1}{2}$ miles of a position situated about 6 miles eastward of the northern extremity of 30 Fordate.

Dangers off the eastern side of Jamdena.—Sari Karmut has been described above. Sari Karmuta, a reef which dries, lies about 7 miles offshore, $10\frac{1}{2}$ miles south-westward of the southern extremity 35 of Larat. Sari Batsir and Sari Waturu, both of which dry, lie about 7 miles offshore, about $8\frac{1}{2}$ and $10\frac{1}{2}$ miles, respectively, southward of Sari Karmuta; there is a depth of 33 feet (10^m1) between the reefs. A 26-foot (7^m9) patch lies about $2\frac{1}{2}$ miles north-north-westward of Sari Batsir. Sari Kilmasa, which dries, lies about 5 miles offshore, 40 about 7 miles south-south-westward of Sari Waturu, and about midway between these two reefs there is another reef which dries, on the southern end of which is an islet, 14 feet (4^m3) high; between Sari Waturu and Sari Kilmasa there are also a number of reefs, with depths of from 6 to 26 feet (1^m8 to 7^m9) over them, the positions of 45 which can best be seen on the chart. Between these reefs and the coast of Jamdena there are several shoal patches, with depths of from 13 to 33 feet (4^m0 to 10^m1), which are seldom marked by discoloration, but none of these lie less than $2\frac{1}{2}$ miles from the coast.

Chart 2759a.



Tanimbar eilanden.—View, in two parts, of Straat Egeron from south-eastward.
(Original dated 1833.)



Tanimbar eilanden.—Approach to Rede Ritabel from northward.
(Original dated 1833.)



Tanimbar eilanden.—Fordate summit, bearing 156°.
(Original dated 1833.)

Chart 3245.

Directions.—A vessel from northward proceeding down the east coast of Jamdena, from December to March, when the North-west monsoon is often very strong, is recommended to pass through Straat Orafruan; after rounding the south-eastern extremity of Larat, a good view may be obtained of the peak on Laibobar (page 203), which lies off the north-western coast of Jamdena. She should pass south-eastward of Sari Karmut and Sari Karmuta and then steer for the distinctive point on which stands the village of Watmuri, situated about $17\frac{1}{2}$ miles south-westward of the southern extremity of Larat; she should give this point a berth of at least one mile, and thence keep at a distance of about $1\frac{1}{2}$ miles offshore to Straat Egeron. Care must be taken when passing the village of Alusi, situated $16\frac{1}{2}$ miles south-south-westward of Watmuri, as the presence of iron ore in that vicinity may cause magnetic disturbance of the compass. A 39-foot (11^m9) coral patch, which lies about $2\frac{1}{4}$ miles eastward of Alusi, should be avoided.

A strong stream of discoloured water often flows from Rivier Weri Tambrian, lying about 4 miles northward of the islets Kore and Mes, situated about 14 miles south-westward of Alusi; a great part of it runs through the passage between Mes and Jamdena. This passage, therefore, should not be used, except when the water is clear and reefs clearly visible. Care must be taken when approaching Straat Egeron to avoid the drying reef, which extends about one mile eastward from Asutubun (*Lat.* $8^{\circ} 03' S.$, *Long.* $131^{\circ} 17' E.$), an island lying close southward of the southern extremity of Jamdena.

Charts 942a, b.

ARAFURA SEA.—The limits of the Arafura or Timor sea are as follows:—

On the north.—The south-eastern limit of the Ceram sea and the eastern limit of the Banda sea.

On the east.—The south-western coast of New Guinea from Karoefa (*Lat.* $3^{\circ} 51' S.$, *Long.* $133^{\circ} 27' E.$) to the entrance to Bensbak river (*Lat.* $9^{\circ} 08' S.$, *Long.* $141^{\circ} 01' E.$) and thence to the north-western extremity of York peninsula, Australia (*Lat.* $11^{\circ} 05' S.$, *Long.* $142^{\circ} 03' E.$) (Australia Pilot, Vol. V.).

On the south.—The northern coast of Australia from York peninsula to Cape Don (*Lat.* $11^{\circ} 19' S.$, *Long.* $131^{\circ} 46' E.$) (Australia Pilot, Vol. V.).

On the west.—A line from Cape Don to Tandjung Aro Usu, the south-western point of Selaru, Tanimbar eilanden.

This sea being little known beyond the routes generally taken by vessels from Timor towards Torres strait, and between Port Darwin and Torres strait, it is probable that shoals exist in addition to those marked on the Admiralty charts. As the positions and even the existence of some of these are doubtful, a vigilant lookout should be kept, with the view to removing these doubts, as well as for the safety of the vessel.

Currents.—The currents in the Arafara sea are variable and the Northerly monsoon does not appear to produce any appreciable predominance of sets to the eastward. There is, however, some predominance of sets to the westward during the period of the Southerly monsoon, April to October. The maximum rate of current does not

Chart 2759a.

Charts 942a, b.

usually much exceed one knot, but occasional currents reaching or slightly exceeding 2 knots have been observed.

Chart 2759a

- 5 **Depths.**—The depths in the greater part of the Arafura sea are less than 100 fathoms (182^m9). They increase from 6 fathoms (11^m0) at the eastern end to about 30 fathoms (54^m9) between Kaap Valsch (page 272), in New Guinea, and Cape Wessel in Australia, whence they increase more rapidly to about 100 fathoms (182^m9), attaining
10 a depth of over 750 fathoms (1371^m6) southward of the Tanimbar eilanden. A less depth, however, continues westward along the northern and north-western coasts of Australia.

The depths over the northern part of this bank, eastward of the meridian of Dundas strait, are fairly regular, but westward of that
15 line, especially near depths of 100 fathoms (182^m9), they are very irregular, and various shoals have been found (*see below*). Other dangers probably exist, and a good look-out should be kept when navigating in these waters.

Isolated dangers in Arafura sea.—The following dangers lie in
20 the Arafura sea between long. 128° E. and long 133° E. and are in the track of vessels making for the northern coast of Australia between those meridians.

Chart 942a.

- Troubadour, a shoal, in Lat. 9° 44' S., Long. 128° 28' E., has a depth
25 of 9 fathoms (16^m5) over it, and is steep-to. A bank, with a least depth of 12 fathoms (21^m9) over it, lies about 13 miles south-eastward of Troubadour.

Chart 1044.

- Flinders shoal, which lies about 50 miles east-south-eastward of
30 Troubadour, has a depth of 5 fathoms (9^m1) over it. A 10-fathom (18^m3) patch is charted about 17 miles north-westward of Flinders shoal. Franklin shoal, situated about 2 miles eastward of Flinders shoal, has a depth of 5 fathoms (9^m1) over it. Blackwood shoal, which lies about 6 miles eastward of Franklin shoal, has a least depth
35 of 7 fathoms (12^m8) over it, coral. Evans shoal, situated about 8 miles eastward of Blackwood shoal, has a depth of 5 fathoms (9^m1) over it, coral, and lies on the northern end of a bank, with depths of from 7 to 10 fathoms (12^m8 to 18^m3) over it.

It is probable that many other shoals exist on or near the same
40 parallel of latitude, both eastward of Evans shoal and westward of Flinders shoal. The four shoals referred to above are probably part of a submerged barrier, lying along the edge of the bank. Northward of them the bottom is globigerina ooze.

- Lynedoch shoal, in Lat. 10° 02' S., Long. 130° 49' E., has a least
45 depth of 6 fathoms (11^m0) over it.

Money shoal, in Lat. 10° 21' S., Long. 132° 45' E., has a least depth of 3 fathoms (5^m5) over it, coral, on its eastern edge, and has been observed to break during fresh easterly winds.

For further details of these and other dangers near the northern
50 coast of Australia, *see Australia Pilot, Vol. V.*

Charts 3246 and 942b.

Le Cher bank (Lat. 8° 27' S., Long. 136° 16' E.), with a least depth of 13 fathoms (23^m8) over it, and steep-to, lies in the northern part of the Arafura sea, about 80 miles westward of Kaap Valsch.

Chart 2759a.

Charts 3246 and 942b.

A shoal area, which up to 1938 had not been examined, lies westward and north-westward of Le Cher bank; a depth of 33 feet (10^m1), lies in the south-western part of the area, about 36 miles westward of the shoalest part of Le Cher bank. (*Lat. 8° 27' S., Long. 136° 16' E.*). 5

A shoal area, which had not been examined, in 1945, lies about 110 miles westward of Le Cher bank, and about 90 miles southward of Enu, the southernmost of the Aru eilanden.

CHAPTER V

COAST OF NEW GUINEA.—TANDJOENG SELE TO KAAP DE GOEDE HOOP,
AND TANDJOENG SELE TO BENSBACK RIVER.—OFF-LYING ISLANDS.

Chart 2759a.

NEW GUINEA.—The western portion, only, of New Guinea, which forms part of the Netherlands possessions, is described in this chapter. The boundary is approximately the meridian of 141° East longitude.

For general remarks on New Guinea, *see* page 4.

Chart 3248.

ISLANDS AND OUTLYING BANKS.—Waigeo, which is described on pages 214-218, and numerous islands and banks lie north-westward and northward of the western end of New Guinea.

Sajang, a low and flat island with high trees, lies about 120 miles north-north-westward of Tandjoeng Sele, the western extremity of New Guinea. A shoal, with a charted depth of 19 feet (5^m8) over it, lies about 2 miles off the south-western side of the island; there are a number of other shoals lying within one mile of the southern and south-western sides of the island, which are discoloured by the white sandy bottom, which can be seen at depths up to 10 fathoms (18^m3). Ai (*Lat. 0° 20' N., Long. 129° 52' E.*), an islet situated about one mile northward of the north-western end of Sajang, is low and flat, with high trees. Hunter bank, with a depth of 49 feet (14^m9) over it, not marked by discoloration, lies about 5 miles eastward of Sajang.

Ormsbee bank, with a least charted depth of 56 feet (17^m1) over it, Winchester bank, with 13 fathoms (23^m8) over it, and Aurora bank, with 46 feet (14^m0) over it, lie about 18 miles, north-north-eastward, 19 miles north-north-westward, and 30 miles north-westward, respectively, of the north-western extremity of Sajang. Breakers are sometimes seen over these banks, but they are not marked by discoloration.

Chart 2788.

The reef, reported in 1945, to lie about 13½ miles north-eastward of Jew island is described on page 95.

Chart 3248.

Wajag, an island, 667 feet (203^m3) high, lies about 7½ miles south-eastward of Sajang. A 16-foot (4^m9) patch, marked by discoloration, and a 26-foot (7^m9) patch, not so marked, lie about 2½ and 3½ miles, respectively, south-south-eastward of the western extremity of Wajag. Stephanie, Quoy, Coquille and Uranie are high, serrated rocky islets, with a number of isolated rocks in their vicinity, lying in that order east-south-eastward of Wajag. *See* view facing page 214.

Chart 1263.

Chart 3248.

A 29-foot (8^m8) patch, marked by discoloration, lies about 1½ miles southward of Stephanie.

Strong tidal streams set round and between these islands. They are uninhabited. The forests on the islands are practically inaccessible owing to the agas (small stinging gnats).

Chart 3745.

Kawé, 2,350 feet (716^m2) high in the southern part, lies about 8 miles north-north-westward of Tandjoeng Sel Pele, the western extremity of Waigeo. The northern part of the island is densely wooded, the 10 southern part is of a reddish colour, sparsely covered with vegetation.

Deem, a rock, 169 feet (51^m5) high, and wooded, lies about 1½ miles north-westward of the north-western extremity of Kawé, and is very prominent. Two rocks, above water, on which the sea usually breaks, lie about three-quarters of a mile off the northern end of Kawé. 15 The tidal streams here are strong, and westward of Deem there are sometimes heavy tide-rips.

Balabalak, an island 582 feet (177^m4) high, and covered with grass, lie nearly 2 miles westward of the southern part of Kawé, with Zwarte Rotsen, 14 feet (4^m3) high, between them. Several shoals, with depths 20 of from 3½ to 7 fathoms (6^m9 to 12^m8) over them, lie about 7 miles south-south-westward of the southern extremity of Kawé. Some rocks above water lie in Straat Bougainville, about 2½ and 3 miles southward, and the island Beo lies about 2½ miles eastward of the same point. 25

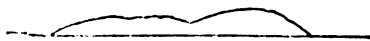
Chart 3248.

Asia eilanden and Ajoe eilanden.—Anchorages.—Asia eilanden, consisting of Fani, Igi and Miarin (*Lat. 1° 00' N., Long. 131° 13' E.*), lie on a drying reef, about 65 miles north-north-eastward of the northern extremity of Waigeo; they are low, but covered with high 30 trees. There are no permanent inhabitants, but the natives from Ajoe eilanden visit the islands occasionally.

The reef on which these islands lie is steep-to, and the edges of the reef are never visible except at low water springs, and consequently 35 must be approached with caution.

The current during the survey, in June, 1928, set strongly westward along the reefs, especially through the passage which lies between the two groups of Ajoe eilanden. The natives state that during the northerly monsoon there is an easterly current, when the swell causes heavy breakers. 40

Ajoe eilanden, situated about 26 miles north-north-eastward of the northern extremity of Waigeo, lie on two extensive reefs which



Ajoe, bearing 045°, about 15 miles.

(Original dated 1933.)

dry. Ajoe, 346 feet (105^m5) high, the largest island of the group, lies on the southern reef, and is inhabited. Oer Babo are two wooded islets lying on the southern reef about 4½ miles west-north-westward 45 of Ajoe.

Mios Koean, the southernmost island on the northern reef, is a sandbank covered with coconut trees, on which there is a village.

Chart 1263.

Chart 3248.

On the southern end there is a noticeable plume-shaped casuarina tree, and close off its northern end there is a rock covered with shrubs. Mios Ros, a wooded rock, lies on the eastern edge of the reef, about 5 one mile eastward of the northern extremity of Mios Koean. Abdon, 293 feet (89^m3) high, lies on the western side of the large lagoon, in the middle of this reef; on its southern side are some houses and coconut trees. Reni and Roeton, situated on the north-eastern part of the reef, are low sandy islets, on each of which are some houses and coconut plantations, and a distinctive square tree in the middle. 10 Kanobé, 198 feet (60^m3) high and wooded, lies on the north-western part of the reef, and is uninhabited. Mios Mandoeng, situated about 1½ miles north-north-westward of Kanobé, is partly rocky and partly sandy, with some houses and coconut trees on it. Awirisi, a group 15 of above-water rocks, lies on the northern end of the reef about 1½ miles east-north-eastward of Mios Mandoeng.

The lagoon, which is entered on the north-western side of the reef, is accessible for a vessel, with a length of 180 feet (54^m9), and a draught of 11 feet (3^m4), preferably at low water, when the reefs are plainly 20 visible. The in-going tidal stream has a rate of about 5 knots in the entrance, and about a quarter of an hour after low water sets strongly over the reefs in all directions; in the channel the stream continues until high water, and then after a short period of slack water, it sets out, but not so strongly as on the in-going stream.

25 On the northern side of the entrance to the lagoon there are some noticeable black rocks which are usually uncovered. A temporary anchorage may be obtained by vessels with local knowledge in the entrance to the channel, but a better anchorage out of the influence of the tidal stream, is in a depth of about 18 fathoms (32^m9), close south- 30 ward of the inner end of the channel. Anchoring in the channel is dangerous.

Navigation must be carried out by eye, which is not difficult if the vessel is conned from aloft. There is a detached reef, with a depth of 6 feet (1^m8) over it, barely marked by discoloration, situated on the 35 southern side of the entrance, and a 13-foot (4^m0) patch lies in the middle of the channel about 1½ miles within the entrance. Vessels should not enter or leave the lagoon during the strength of the tidal stream at springs.

40 **Budd.**—Budd, or Moff, is a low uninhabited islet, covered with trees, lying about 23 miles westward of Abdon.

Chart 3745.

WAIGEO.—This island, situated north-westward of the western extremity of New Guinea, is almost entirely occupied by mountainous and hilly land, which slopes down to its coast without any beach. 45 Serodjil, 3,078 feet (938^m2) high and conical, stands on the northern side of the island, about 15 miles from the western end. Buffelhoorn (*Lat.* 0° 05' S., *Long.* 130° 45' E.), 3,108 feet (947^m3) high, stands about 14 miles eastward of Serodjil, and is very prominent, its steep horn-shaped summit showing above the adjacent mountains. The 50 whole island is clothed with dense forest. *See* views facing this page.

Western side of Waigeo.—**Coast.**—**Anchorage.**—The west coast is high, and fringed mostly by a narrow, steep-to coral reef. Aljoei baai has two entrances, separated by a group of islands, and

Charts 2759a, 1263.



Copville.

Islands north-westward of Waigeo.

(Original dated 1933.)

Uranie,
bearing 292° , 7 miles.



Buffelhoorn.

Schoon
bearing 073° , 15 miles.

Sipsipa.

Buffelhoorn,
bearing 112° , 26 miles.

Saripa baai.



Buffelhoorn.



Manseron,
bearing 080° , 16 miles.

Fofak baai.

Three views of the north coast of Waigeo

(Original dated 1933.)

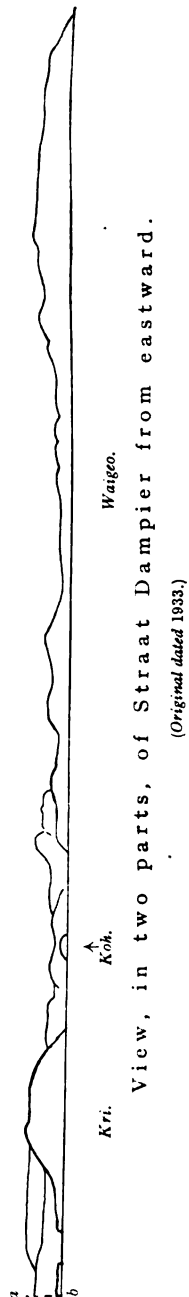
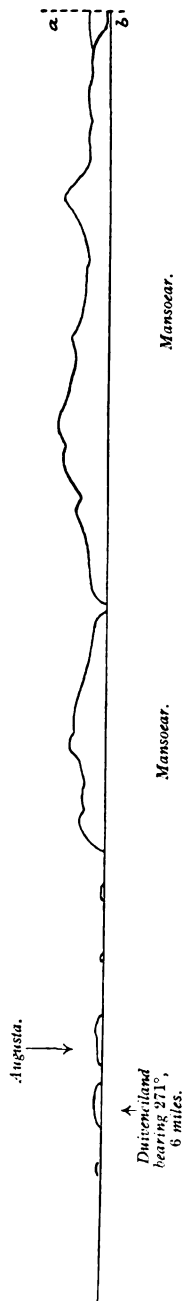
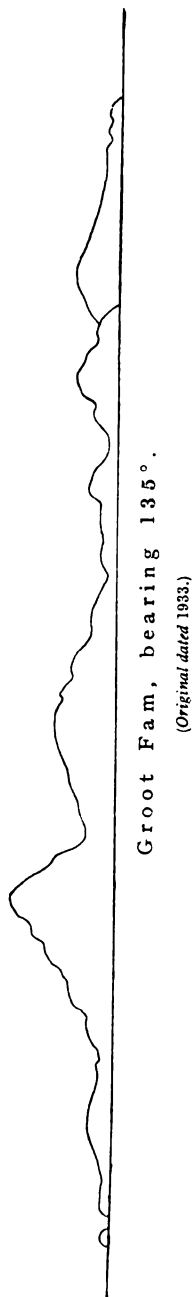


Chart 3745.

in its inner-part is entirely landlocked. The southern entrance lies between Tandjoeng Sel Pele, the western extremity of Waigeo, and Kaap D'Entrecasteaux, situated about $1\frac{1}{2}$ miles north-north-westward. Kaap D'Entrecasteaux is the western termination of the westernmost island of the group which separates the two entrances of Aljoei baai, and rises to an elevation of 916 feet (279^m2).

Groote Tafelberg, 1,592 feet (485^m3) high, and Kleine Tafelberg, 1,441 feet (439^m2) high, lie about 7 miles east-south-eastward and 9 miles eastward, respectively, of Tandjoeng Sel Pele (*Lat.* $0^{\circ} 12' S.$, *Long.* $130^{\circ} 13' E.$). Waisilip, 1,014 feet (309^m1) high, lies about 2 miles south-eastward of Groote Tafelberg, and appears isolated from south-westward.

On the northern side of the northern entrance there are two $3\frac{1}{2}$ -fathom (5^m9) patches. The western entrance to the outer part of the bay is clear except for a drying part under the southern shore. On the northern side of the entrance to the inner part there is a shoal with a depth of 2 fathoms (3^m7) over it, and on the southern side there is a reef which dries; the navigable channel here has a width of about 2 cables with a least depth of $6\frac{1}{2}$ fathoms (11^m9) in it.

To pass through the northern channel into the inner part of the bay a vessel should bring a high bell-shaped islet situated on the northern side of the passage, ahead, bearing 095° , and keep it so until the north-eastern extremity of the island which lies on the southern side of the passage bears 135° , when course should be altered sharply for that extremity and held, for about half a cable, until mid-channel; course should then again be altered sharply to 104° for the inner bay. The least depth on this track is about 11 fathoms (20^m1). A strong tidal stream may be encountered in the passage.

There is also a passage southward of the island which separates the inner from the outer part of the bay, in which there is a least depth of $6\frac{1}{2}$ fathoms (11^m9). A vessel should keep in the centre of the channel until approaching its eastern end, when she should keep towards the northern side, passing northward of several small rocks off the southern shore; the channel, here, is little more than 2 cables wide but the water is deep. A strong stream may be encountered in this passage also.

The northern inner bay may be entered through a deep, clear channel a little more than 2 cables in width.

The outer part of the bay affords anchorage in depths of from 23 to 30 fathoms (42^m1 to 54^m9). The inner part of the bay and the bay northward of it afford excellent anchorage, in depths of from 14 to 18 fathoms (25^m6 to 32^m9).

A shoal, with a depth of $2\frac{1}{2}$ fathoms (4^m1) over it, lies about 3 cables northward of the island lying in the middle of the inner part of the bay.

Except for the inhabitants of Kampoeng Sel Pele, situated close within Tandjoeng Sel Pele, and a Papuan settlement on the northern side of the entrance of the outer part of the bay, none were seen in 1918.

Off-lying islands and dangers. Anchorage.—A rock, 167 feet (50^m9) high, lies about $2\frac{1}{2}$ miles north-north-eastward of Kaap D'Entrecasteaux.

Mé, 761 feet (232^m0) high, lies close offshore 5 miles north-north-eastward of Kaap D'Entrecasteaux. A rock, with a depth of a quarter

Charts 942b, 2759a, 1263.

Chart 3745.

of a fathom (0^m5) over it, lies about one mile northward of Mé, and close southward of the rock there is a boulder, which dries.

- Southward of Tandjoeng Sel Pele (*Lat. 0° 13' S., Long. 130° 13' E.*) there is a group of islands, of which Batang Pele, 1,204 feet (367^m0) high, which is prominent, and Minjai Foen are the largest. Kampoen War Parear, situated on the northern side of Minjai Foen, is the only permanent settlement on the islands. Anchorage may be obtained by vessels with local knowledge, in a depth of about 14 fathoms (25^m6), sand, off this village. A vessel approaching it either from eastward or westward should follow the coast of Minjai Foen at a distance of about one cable. Djoe is an island lying about 1½ miles westward of Minjai Foen; about 2½ miles north-westward of Djoe is a shoal, with a least depth of 4 fathoms (7^m3) over it.
- 15 Gemien, 738 feet (224^m9) high, lies close offshore about 15 miles eastward of Batang Pele. Between these islands there are many islets and dangers, the positions of which may best be seen on the chart. Of these, Fwojo, lying about 3 miles southward of Minjai Foen, Jef Tsiep, lying about 3½ miles east-south-eastward, Moetoes Besar and 20 Moetoes Ketjil, lying about 7 miles eastward of Minjai Foen, are low coral islets. There are coconut plantations on Jef Kaboe and Mios Arar, situated about one mile and 4½ miles, respectively, south-westward of Moetoes Ketjil. Biantsji Besar, 445 feet (135^m6) high, lies 6½ miles eastward of Batang Pele; a drying reef extends over 2½ 25 cables northward from this island. The passages between this island and the surrounding islands must be avoided until a further survey of the area has been made.

- Jeben and Apibok are rocky islets, with a reef, which dries, about midway between them lying about 4 and 6 miles, respectively, west- 30 north-westward of the south-western extremity of Gam (page 220; above water rocks lie south-westward of Jeben.

- Coast.—Anchorage.**—Between Tandjoeng Manare, situated about 7 miles east-south-eastward of Tandjoeng Sel Pele, and Tandjoeng Ombrab, the north-western extremity of Gam, which lies 14 miles 35 south-eastward, there is a large bight, in the north-eastern corner of which is Waisai baai, in which good anchorage may be obtained off Kampoen Waisai.

- Waisai and Waiwoom, situated about 4 miles southward, are the only two villages on the south-western coast of Waigeo. If bound for 40 Waisai baai from southward, a vessel may pass on either side of Peniki, an islet lying about 4½ miles south-westward of Gemien. The reef about midway between them is not well marked by discoloration. Great caution is necessary when proceeding through the channels between the islands.

- 45 Anchorage may be obtained in Warparim baai, situated on the north-western side of Gam. A vessel approaching this anchorage should pass close to Tandjoeng Ombrab, on account of numerous shoals which lie northward and north-westward of that point.

- Northern side of Waigeo.—Anchorages.**—Except in the bays, the 50 northern coast of Waigeo is mostly rocky, and in some places rises vertically from the sea; the entire coast westward of Fofak baai is steep. There are several good anchorages, the most sheltered of which is in Fofak baai. The coast is sparsely populated, the only village being in Kabarei baai.

Charts 942b, 2759a, 1263.

Chart 3745.

Mané Tep baai, situated close eastward of Mé (page 215), affords anchorage, in depths of from 20 to 25 fathoms (36^m6 to 45^m7), coral and sand. The entrance is clear of dangers on its eastern side. A stream flows into the bay at the eastern end of the sandy beach. 5

Telok Woenoh is separated from Mané Tep baai by a tongue of high land, rising steeply from the sea, eastward of which is a convenient anchorage. Southward of the anchorage, a pinnacle rock lies nearly half a mile offshore.

The high island of Woenoh fronts the bay, with rocks above and 10 below water, between it and the coast southward; the rocks above water are covered with vegetation.

Chart 1416, plan of Saripa baai.

Saripa baai.—Anchorage.—Saripa baai is separated from Telok Woenoh by a narrow, steep, and moderately high, tongue of land, from 15 the northern end of which rocks, above water, extend 3 cables north-westward.

The entrance to the bay, which is about half a mile wide, lies between these rocks and others, which extend about 6 cables north-westward from Sipsipa, an islet lying close off the eastern entrance 20 point. See view facing page 214. There are some islets on the shore reef near the head of the bay. Small vessels may obtain anchorage in the inlet, at the eastern side of the entrance to the bay.

A village stands on the western side of the bay about half a mile southward of the western entrance point; there is another situated at 25 the head of a small inlet on the eastern side of the bay about 1½ miles south-south-eastward of the eastern entrance point.

Chart 3745.

Off-lying islands and dangers.—Seprang eilanden (*Lat.* 0° 01' S., *Long.* 130° 18' E.) a group of rocky islets, the western and highest of 30 which has an elevation of 122 feet (37^m2), lie 5½ miles north-north-eastward of Mé. Loh Loh consists of six low rocky islets in two groups which lie about 6 and 8 miles, respectively, eastward of Seprang. Schoen eiland, highest at its eastern end, lies close off the coast, 4½ miles east-south-eastward of Loh Loh. Arago baai, entered between 35 the eastern extremity of this island and Kaap Arago, situated 2½ miles eastward, has some rocks above water in its entrance.

Chart 1416, plan of Fofak baai.

Fofak baai.—Anchorage.—This bay is entered between Hoek Forrest, which lies about 22 miles eastward of the entrance to Saripa 40 baai, and Rotisge hoek, situated about three-quarters of a mile farther eastward. About 2 cables north-north-westward of Rotsige hoek, there are some rocky islets, shaped like beehives, and on the eastern side of the entrance are Lélédé, some rocks above water. On the southern side of the bay, southward of the entrance, is an islet, con- 45 nected to the shore by a reef. A reef also extends about 2 cables from its western side, forming a cove southward of it, in which anchorage may be obtained, in depths of from 12 to 20 fathoms (21^m9 to 36^m6), mud. A 15-foot (4^m6) patch lies 4½ cables eastward of this islet. A rock awash lies about one mile south-westward of Hoek Saine, the 50 northern entrance point of the western arm of the bay.

Delphine and Eugénie are islets lying on the edge of a mudbank which extends from the head of the bay. Vessels should not proceed eastward of these islets.

Charts 942b, 2759a, 1263.

Chart 1416, plan of Fofak baai.

Fresh water can be obtained, from a waterfall situated on the northern shore of the bay, by laying a hose.

Chart 3745.

- 5 **Off-lying islands.**—Manoeran, 975 feet (297^m2) high, lies about 2 miles offshore and 8½ miles east-north-eastward of Rotsige hoek. (See view facing page 214). A reef, with a depth of 2¾ fathoms (5^m0) over it, lies about half a mile off its south-eastern side.

Chart 1416, plan of Kabarei baai and Lawak channel.

- 10 Lawak, a rocky island, 620 feet (189^m0) high, lies close offshore, 3 miles south-eastward of Manoeran; it is separated from the coast of Waigeo by a navigable channel about 1½ cables wide, with a least depth of 39 feet (11^m9) in the fairway, but there is a 3-fathom (5^m5) patch in the middle at the north-eastern end of the channel.

- 15 **Anchorage.**—**Dangers.**—Anchorage may be obtained during the southerly monsoon, between Lawak and Tandjoeng Wariai (chart 3745), which lies 5½ miles eastward, in any required depth.

- Kabarei baai, entered between a point situated half a mile eastward of Lawak, and another, situated about one mile farther eastward, is
20 open northward. There is a village at the head of the bay, which is shallow.

Chart 1416, plan of Channels near Boni.

- Boni (Lat. 0° 03' S., Long. 131° 04' E.), a low islet, covered with high trees, lies about 1½ miles south-eastward of Tandjoeng Wariai. A reef
25 extends about 1½ miles from its northern side and about 1½ miles from its eastern side. Between Boni and the coast of Waigeo there is a channel, with a least depth of about 46 feet (14^m0) in the fairway, in which anchorage may be obtained over mud and sand, but there is foul ground off the coast forming the southern side of the channel southward
30 of Boni.

- The eastern approach to this anchorage, between the reef extending eastward from Boni and Bombédari, a low islet, covered with vegetation, lying close off the coast of Waigeo, 1½ miles south-eastward of Boni, is deep and about half a mile wide. The narrow channel between
35 Bombédari and the coast of Waigeo is encumbered with rocks.

A reef, with a depth of 3 fathoms (5^m5) over it, lies in the northern approach to Boni, about 3 miles north-north-westward of Tandjoeng Wariai. A village stands on the coast about half a mile south-south-eastward of Tandjoeng Wariai.

40 *Chart 3745.*

- Coast.**—Between Tandjoeng Saobas, which lies about 7½ miles south-eastward of Tandjoeng Wariai, and Hoek Lamarche, a low point, situated about 10 miles farther south-eastward, the coast is fringed by a reef, and there is no anchorage. The coast is low, with fairly distinctive
45 mountains farther inland. Zadelberg, 2,271 feet (692^m2) high, stands about 8½ miles southward of Tandjoeng Saobas. Poepri, 857 feet (261^m2) high, and outstanding, lies about one mile southward of Hoek Lamarche.

The southern side of Waigeo is described on page 220.

- 50 **STRAAT DAMPIER.**—This strait lies between the southern side of Waigeo and Batanta. The main channel is between the islands Mansoear, Kri, and Koh, situated about 3 miles southward of Gam (page 220), on the north, and the islets Augusta and Duiveneiland on

Charts 942b, 2759a, 1263.

Chart 3745.

the south. There is a safe channel southward of Duiveneiland, and another along the northern side of Batanta. See views facing page 215 and page 222.

Tidal streams.—In the western approach to Straat Dampier 5 between Kofiau (page 119) and the western end of Batanta, there is frequently a south-going stream from September to April, but the streams are greatly affected by the direction and force of the wind. From May to August the stream here sets north-west and north, whilst there is little or no stream during the transition months. 10

In the height of the North-west monsoon, in the narrow part of the strait, between Duiveneiland and Djerief, the stream at springs sets east-north-eastward for 6 or 8 hours, at the rate of 4 to 5 knots, and from one to 3 knots at neaps during the falling tide, and sets south-westward for 3 or 4 hours, during the rising tide, but is weak. During 15 the height of the South-east monsoon, from May to September, in this part, the stream sets westward for 8 or 10 hours, during the rising tide, turning gradually to south-west by south; it then attains its greatest rate, which at springs, sometimes exceeds 5 knots, and at neaps, 4 knots. The stream during the falling tide at this season, sets east-north-east 20 or north-east, and is neither strong nor of long duration; however, a rate of 4 knots, during one or 2 hours, has been observed.

The stream during the falling tide is usually strongest at the eastern entrance to the strait in both monsoons, and during the South-east monsoon an easterly stream sometimes runs for two or three days 25 together.

Islands and dangers.—Anchorages.—Jef Fam consists of two groups of islands, situated in the western approach to Straat Dampier. Groot Fam or Penemoe, the largest of the northern group, is 700 feet (213^m4) high at its north-western end, and is very steep. See view 30 facing page 215. There are no permanent inhabitants on this island. A 4½-fathom (8^m2) patch lies 3½ miles westward of the southern extremity of Groot Fam. Keroeo (*Lat. 0° 35' S., Long. 130° 18' E.*) is the largest of the rocky islets lying within one mile eastward of the southern part of this island. 35

The channels between Groot Fam and Jeben (page 216), which lies about 6 miles north-eastward, and between Groot Fam and Fam, situated about 2½ miles southward, are clear of dangers.

Fam, the largest and northernmost of the southern group, is 453 feet (138^m1) high, near its western end, and is outstanding owing to its flat 40 summit; at the eastern end of the island there are two hills of about the same elevation. Mingiman and Jar, at the south-western end of the group, are, like the islands between, low coral islands with high trees on them. A 2¾-fathom (5^m0) patch lies about 2½ miles eastward of Fam and a 1½-fathom (2^m7) patch lies about one mile southward of 45 Mingiman. These shoals and several others around the group, the positions of which may best be seen on the chart, are mostly well marked by discoloration.

Anchorage may be obtained in a few places in the southern group. The tidal streams may attain a rate of from 2 to 3 knots. 50

Woodford reefs, which lie about 7½ miles east-south-eastward of Fam, consist of three rocky patches, with depths of 2½ and 3½ fathoms (5^m0 and 5^m9) over them; they are only slightly marked by discoloration.

Charts 942b, 2759a, 1263.

Chart 3745.

Augusta and Duiveneiland are low flat islets with high trees on them, lying within the western edge of a ridge, which extends east-south-eastward towards the eastern end of Batanta. Although the channel
 5 between the two islets is deep, vessels are recommended not to use it on account of the strong tidal streams. A shoal, with a depth of $5\frac{1}{2}$ fathoms (10^m1) over it, lies about $2\frac{1}{2}$ miles north-westward, two 5-fathom (9^m1) patches lie about 2 miles westward and one mile north-westward, respectively, of Augusta and also within $1\frac{1}{2}$ miles eastward of
 10 Duiveneiland.

Djerief, on the south-western extremity of a reef, which dries, about 7 miles east-south-eastward of Duiveneiland, is low and flat, with high trees on it. Reefs, which dry, lie within 5 miles west-south-westward of Djerief. Mansfield eilanden consist of three flat islets,
 15 lying on drying reefs, about 4 miles eastward of Djerief; there are some high trees on the north-easternmost islet. The large reefs, which dry, are marked by discoloration. Several shoals, with depths of from 4 to $5\frac{1}{2}$ fathoms (7^m3 to 10^m1) over them, lie within 3 miles north-westward and north-eastward of Djerief. See view facing page 222.
 20 The area between the reefs on which Djerief and Mansfield eilanden lie should be avoided, as unknown danger may exist.

Mansoear has three inconspicuous peaks, the highest of which has an elevation of 1,253 feet (381^m9), situated about the middle of the island; near the eastern end there is a more distinctive peak, 853 feet (260^m0)
 25 high. Kampoeng Mansoear stands about half a mile westward of the eastern peak. The southern coast, which rises steeply from the sea, is clear of dangers. See view facing page 215. Kri, 702 feet (214^m0) high, and Koh, 132 feet (40^m2) high, lie close north-eastward of Mansoear. The village of Janboeba stands at the western end of Kri. Kri
 30 is connected to Mansoear by a reef, on which there is an islet; there is no passage between Kri and Koh. A shoal, with a least depth of 2 fathoms (3^m7) over it, lies about $1\frac{1}{2}$ miles north-eastward of Koh (*Lat. $0^\circ 33' S.$, Long. $130^\circ 41' E.$*).

The passage between Mansoear and the southern side of Gam, situated about 3 miles northward, is much encumbered with reefs which
 35 dry and detached shoals, the positions of which may best be seen on the chart. Airborei is an islet lying near the western edge of one of these reefs, about $3\frac{1}{2}$ miles north-westward of the western extremity of Mansoear.

40 **Southern side of Waigeo.—Coast.**—Gam, separated from the southern side of Waigeo by Straat Kaboei, is 1,326 feet (404^m1) high in its north-eastern part; about $2\frac{1}{2}$ miles southward of its summit there is a remarkable peak, 968 feet (295^m0) high. The west coast is steep, and the south coast rises sheer from the sea. There is a village named
 45 Swingkrai, which stands on Tandjoeng Besir, the eastern entrance point of a bay on the southern side of the island, and another situated about one mile south-westward of Tandjoeng Jennanas, the eastern extremity of the island.

Keroepiar, a rock 30 feet (9^m1) high, lies about one mile off the south-
 50 eastern side of Gam, $4\frac{1}{2}$ miles south-south-westward of Tandjoeng Jennanas. Camphuys or Mios Kon, 135 feet (41^m1) high, lies $3\frac{1}{2}$ miles south-eastward of the same point. Friwinbonda and Friwin are islets, 30 feet (9^m1) high, lying about $1\frac{1}{2}$ miles southward of Tandjoeng Jennanas.

Charts 942b, 2759a, 1263.

Chart 3745.

Straat Kaboei is a very narrow channel with a least depth of three-quarters of a fathom (1^m4) in it, and is only available for small craft with local knowledge. The tidal stream in the strait sometimes attains a rate of 4 knots, and causes tide-rips and eddies. 5

Kaboei baai is formed between the northern coast of Gam and Waigeo. The eastern entrance between Tandjoeng Jennanas and the coast of Waigeo north-eastward, is about $1\frac{1}{2}$ miles wide and deep, but narrows to one mile abreast Oera, an islet, 410 feet (125^m0) high, about $1\frac{1}{2}$ miles within; there may be a strong tidal stream in this 10 channel. There are several Papuan settlements on the shores and on the islets in the bay.

Chart 1416, plan of Rede Saonek.

Rede Saonek.—Anchorage.—Saonek Besar, 145 feet (44^m2) high, covered with vegetation, and Saonek Ketjil, 230 feet (70^m1) high, and 15 wooded, lie about $5\frac{1}{2}$ miles east-south-eastward and $6\frac{1}{2}$ miles eastward, respectively, of Tandjoeng Jennanas. Except on the north-western side, where Kampoeng Saonek is situated, Saonek Besar is fringed by a reef, which extends 2 cables from its western side, and is marked by discoloration. See view facing page 222. 20

A reef, with a depth of 11 feet (3^m4) over it, lies $1\frac{1}{2}$ miles north-westward of Saonek Besar, and is marked by discoloration.

There is a boat pier at Kampoeng Saonek, and two small piers for the use of praus, westward of it.

Anchorage may be obtained, in a depth of about 16 fathoms (29^m3), 25 sand, on the line of the prolongation of the boat pier. A vessel intending to remain a long period should moor.

Chart 3745.

Coast.—The coast of Waigeo, from abreast Saonek Besar to the entrance to Majalibit baai, a distance of about 10 miles east-north- 30 eastward, is moderately low, thence for 9 miles eastward it rises steeply, after which it again becomes low. A conical peak, 1,483 feet (452^m0) high, stands about $4\frac{1}{2}$ miles north-eastward of Saonek Ketjil (Lat. $0^\circ 25' S.$, Long. $130^\circ 41' E.$) and Bomjai a round mountain, 2082 feet (634^m6) high, which stands about 5 miles northward of the 35 peak, are prominent. About 6 miles east-north-eastward of Bomjai, on the eastern side of Majalibit baai, there is a range with five peaks, lying in a north-westerly and south-easterly direction. An isolated mountain, 1,168 feet (356^m0) high, rises close to the coast where the high land ends, about 14 miles westward of Tandjoeng Momfafa, the 40 eastern extremity of Waigeo. About 8 miles farther east-south-eastward is a prominent mountain, 1,605 feet (489^m2) high, lying close within Tandjoeng Imbikwan, the south-eastern point of Waigeo. Zadelberg, about 10 miles northward of Tandjoeng Imbikwan, has been described on page 218. 45

Majalibit baai, entered about 16 miles east-north-eastward of Tandjoeng Jennanas, extends north-westward to within less than 2 miles of the northern coast of the island. A path leads to Fofak baai (page 217). See view facing page 222.

A rock, with a depth of less than one fathom (1^m8) over it, lies about 50 2 cables offshore on the eastern side of the entrance and about one mile eastward of the western entrance point.

The bay is entered through a narrow strait, about 5 miles in length, with high sides, in which the tidal streams attain a rate of about

Charts 942b, 2759a, 1263.

Chart 3745.

5 knots, in places, at springs; eddies form, with counter-currents along the shore. These conditions and a sharp turn in the northern part of the strait, together with the tidal stream disturbance caused by Poeloe Manil (*Lat. 0° 21' S., Long. 131° 54' E.*), situated about one mile westward of the sharp turn, limit navigation to vessels of not more than 300 feet (91^m4) in length. Vessels are advised to await slack water before entering. There is a scoured channel through the strait, with a reported least depth of 6 fathoms (11^m0), and general depths of 8 fathoms (14^m5) and over in it. After passing through the strait, Majalibit baai proper is entered, where, it is reported, there are no navigational difficulties, and that the bay shoals very gradually to the head.

The general directions given below should be of assistance in following the scoured channel through the strait.

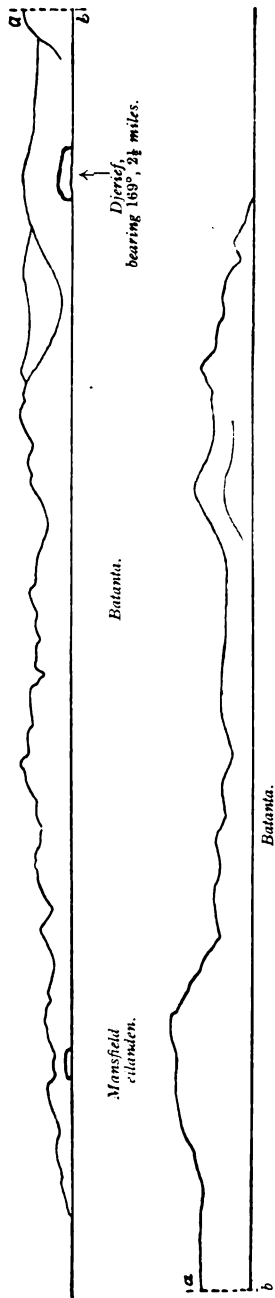
A mid-channel course, of about 308°, should be steered for the first mile of the strait; then, the point on the western side of the channel, about 2 miles north-westward, should be brought into line with the point beyond it on the opposite side of the channel, bearing 330°, and kept in line for another mile, after which the western shore should be followed at a distance of about one cable until the point on the eastern side is abeam. A mid-channel course should then be held for about half a mile to, and through, the narrows, which are less than 1½ cables wide, and where the strait turns abruptly westward. Having passed the narrows the channel is clear of shoals to Poeloe Manil which should be passed on its northern side. When leaving the bay, owing to the tidal stream disturbance in its vicinity, Poeloe Manil should be passed on its southern side.

Siam rivier, probably the largest in Waigeo, flows out on the eastern side of the bay in the vicinity of Tandjoeng Siam, a low point which lies about 12 miles within the entrance; the river is about a quarter of a cable wide and flows rapidly. Noe, an inhabited island, lies near the southern end of the bay, and the Kaiawat rivier, which is about 75 yards (68^m6) wide at its mouth, flows out on the western side. About 6 miles within Tandjoeng Siam is Bé, the largest of a number of steep islets which lie across the fairway. At the head of the bay there are three bights, the two western of which are separated by a narrow peninsula. There are several small villages on the shores of the bay.

Memjai, an islet, 437 feet (133^m2) high, and covered with vegetation, lies about 14 miles eastward of the entrance to Majalibit baai and about half a mile offshore. Wajam is a low islet with high trees, lying about one mile southward of Tandjoeng Imbikwan; a reef, on which there is a sandy patch above water, extends north-eastward from the eastern extremity of the islet. Tandjoeng Momfafa is low at its extremity, but rises to hilly land within.

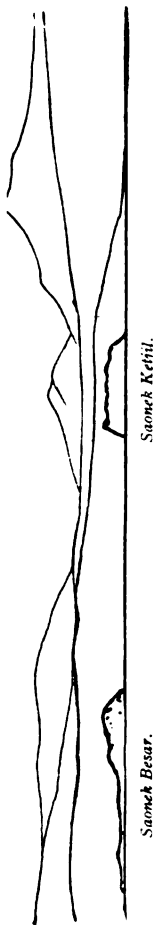
Off-lying dangers.—A 1½-fathom (3^m2) patch lies about 3 miles eastward of Saonek Besar. A ridge of reefs extends along the southern coast of Waigeo, from a position situated about 4 miles eastward of Saonek Besar to about 1½ miles westward of Memjai, from about 1½ to 3 miles offshore; there are many patches, which dry, and some covered with vegetation. There is a gap in the ridge southward of the entrance to Majalibit baai, but in the middle of it there is a 2-fathom (3^m7) patch, only slightly marked by discoloration at times. There is another gap about 3 miles southward of Kampoeng Wakré, situated

Charts 942b, 2759a, 1263.



Straat Dampier.—View, in two parts, of the north coast of Batanta.

(Original dated 1933.)



South coast of Waigeo.—Saonek Besar and Saonek Ketjil from southward.

(Original dated 1933.)



South coast of Waigeo.—Entrance to Majalibit baai from south-eastward.

(Original dated 1933.)

Batanta summit,
bearing 002°, 16 miles.
↓

↑
Vischers.
Tandjoeng
Mabo.

Western part of Batanta from southward.

(Original dated 1933.)

Batanta,
3,511 feet.
↓

Wagom geberge.

Schildpad
eilanden.

↑
Entrance to
Straat Sagewin.

Salawati.

Gebroken
eilanden.

Approach to Straat Sagewin from vicinity of Doea eilanden.

(Original dated 1933.)

Wagom,
bearing 035°, 15 miles.
↓

Approach to Straat Sagewin from southward.

(Original dated 1933.)

Eftawa.

Taraja.

Denis,
bearing 037°, 6 miles.

Oemat.

Gebroken eilanden from south-westward.

(Original dated 1933.)

Chart 3745.

on the main island about $2\frac{1}{2}$ miles north-north-westward of Memjai. A vessel should not enter unless the reefs are plainly visible; a rock, which dries, lies about three-quarters of a mile south-westward of the village.

5

Another ridge extends parallel with the coast from 5 miles westward to 5 miles north-eastward of Wajam, where there is an above water patch. There are some patches, which dry, on the western edge of this ridge, one of which is composed of bright white sand, and just before low water, is divided into two separate parts.

10

A bank extends eastward for about 7 miles and northward for about 3 miles from Tandjoeng Momfafa; there is a depth of 5 fathoms (9^m1) at the eastern extremity of this bank and $3\frac{1}{2}$ fathoms (6^m4) at the northern end, with shoal depths between them. Vessels can pass inshore of this bank by keeping about one mile from the coast.

15

Batanta.—Anchorages.—This island, which lies on the southern side of Straat Dampier, consists of a chain of densely wooded mountains; Batanta (*Lat. $0^\circ 52' S.$, Long. $130^\circ 36' E.$*), its summit, attains an elevation of 3,508 feet (1069^m2). See views facing pages 222 and 223.

The northern coast is formed by spurs from the mountains, between which lie bays with considerable depths, in some places only separated from one another by a chain of reefs. Except for the westernmost bay, this coast affords good anchorages for vessels with local knowledge, where they can lie completely sheltered, but there are no good landmarks for approaching them. There are a few small scattered villages.

25

Off-lying danger.—Batanta rif is the eastern extremity of the ridge which extends across Straat Dampier from Augusta and Duiven-eiland (page 220). Between Mansfield eilanden and Batanta rif there are several patches, with depths of from 2 to 5 fathoms (3^m7 to 9^m1) over them and the least depth on Batanta rif is $2\frac{1}{2}$ fathoms (4^m6), situated about $5\frac{1}{2}$ miles eastward of Tandjoeng Evanas, the eastern extremity of Batanta.

30

Directions for Straat Dampier.—A vessel approaching Straat Dampier from westward should steer for the high north-western extremity of Batanta, keeping well southward of the Jef Fam group, thence, if intending to use the main channel (page 218), the western extremity of Mansoear should be kept on such a bearing, paying attention to the stream as will lead clear of the shoals. When the eastern extremities of Augusta and Duiven-eiland are in line, bearing 108° , she should alter course to 070° , passing southward of Mansoear, Kri and Koh.

40

If proceeding to Rede Saonek, the vessel should pass well eastward of the 2-fathom (3^m7) shoal, situated $1\frac{1}{2}$ miles north-eastward of Koh. Saonek Besar may be passed on either side, but, if proceeding westward of it, the reef extending westward from that side of the island must be given a good berth.

45

A vessel may use the channel southward of Augusta and Duiven-eiland. When Camphuys is seen midway between Kri and Koh, bearing 028° , she may alter course on to this alignment, which will lead, in depths of from 6 to 7 fathoms (11^m0 to 12^m8), eastward of the ridge extending from Duiven-eiland, or if a greater depth is required when Duiven-eiland is abeam on the port hand, she should turn two or three points to starboard, until the hill, situated $3\frac{3}{4}$ miles north-north-westward of Saonek Besar, is in line with the north-western side of

50

Charts 942b, 2759a, 1263.

Chart 3745.

Camphuys, bearing 023° . A vessel approaching from eastward should bring these marks on astern in good time, and keep them on until the eastern extremities of Duiveneiland and Augusta are in line, bearing 5288° , when she may steer through the clear passage northward of the north-western extremity of Batanta.

A vessel proceeding through the channel along the northern coast of Batanta should keep northward of the line joining the northern extremities of Dajang and Wroewarez, situated about $2\frac{1}{2}$ and 20 miles respectively, east-north-eastward of the north-western extremity of Batanta; thence keep close outside the salient points to avoid the detached shoals northward, until Tandjoeng Kandorwa, the south-eastern extremity of Batanta, is in line with the eastern extremity of Ajemi (page 225), bearing about 211° , which, if kept in line astern, will lead over the ridge north-westward of Batanta rif. If proceeding southward, after rounding Tandjoeng Evanäs (*Lat. $0^{\circ} 47' S.$, Long. $130^{\circ} 55' E.$*), the vessel may proceed southward to the deep channel eastward of Straat Sagewin.

STRAAT SAGEWIN.—Light.—This strait, between the southern side of Batanta and Salawati, is a deep and safe channel for power vessels; both sides of the strait are steep-to. Both entrances are frequently obscured by heavy showers of rain, so that caution should be exercised when navigating the strait at night. See views facing page 223.

Vissschers eiland, a rocky and wooded islet, 213 feet (64^m9) high and steep-to, lies about $1\frac{1}{4}$ miles westward of Tandjoeng Mabo, the western extremity of Batanta. This cape, which is 325 feet (99^m1) high, is the termination of a low neck of land, and from a distance appears as an islet.

A light is exhibited, at an elevation of 347 feet (105^m8), from a white iron framework tower, 33 feet (10^m1) in height, which stands on the northern side of the strait about $13\frac{1}{2}$ miles eastward of Tandjoeng Mabo.

Sagewin, a hilly island, lies close northward of Tandjoeng Dadi, the north-western extremity of Salawati, with a clear deep channel between.



Two peaks south-east of Wagom, bearing 072° ,
17 miles.

(Original dated 1933.)

There is a village, with some coconut trees, on the north-western extremity of Sagewin. The north-western part of Salawati is mountainous, attaining an elevation of 2,969 feet (904^m9), about 8 miles eastward of Tandjoeng Dadi, its north-western extremity. About one mile south-eastward of the summit is Wagom, and $5\frac{1}{2}$ miles farther south-eastward are two peaks 820 feet (249^m9) high.

Kampoeng Djodlo, situated on the northern side of the strait, about $4\frac{1}{2}$ miles west-south-westward of Tandjoeng Kandorwa, is the only settlement of any importance.

Chart 1416, plan of Straat Sele.

Jef Doif or Sapan, an islet, 555 feet (169^m2) high, lies about one mile northward of Tandjoeng Majasalava, the north-eastern extremity

Charts 942b, 2759a, 1263.

Chart 1416, plan of Straat Sele.

of Salawati, to which it is connected by a shallow ridge. A reef, on which there are two rocks, which dry, lies about $1\frac{1}{2}$ miles westward of the southern extremity of Jef Doif.

Chart 3745.

Anchorage.—Anchorage may be obtained, in a depth of about 25 fathoms (45^m7), about one cable offshore, off the south-eastern extremity of Sagewin, but the tidal streams here may attain a rate of from 3 to 4 knots, probably at about high and low water. Vessels may obtain anchorage in the same depth, over a sandy bottom, about $1\frac{1}{2}$ cables offshore, off Kampoeng Tipin, situated westward of a rivulet, on the southern side of the strait about $8\frac{1}{2}$ miles eastward of Tandjoeng Dadi; the coast here is lower than elsewhere, and is covered with coconut trees; there is a depth of about 155 fathoms (27^m4), about three-quarters of a cable offshore.

Good anchorage may be obtained during the South-east monsoon, in a depth of about 27 fathoms (49^m4), sand, off the mouth of a rivulet which flows out into the south-western corner of the bight on the northern side of Salawati, situated about $6\frac{1}{2}$ miles westward of Tandjoeng Majasalava.

Chart 1416, plan of Marchesa baai.

Marchesa baai, entered between Tandjoeng Kandorwa and Tandjoeng Makoi, which lies about $2\frac{1}{2}$ miles north-eastward, affords a safe anchorage at its head, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), mud and sand. Large vessels should enter northward of Ajemi, an islet lying in the entrance, and steer for Maribio, a prominent islet at the head of the bay. The entrance southward of Ajemi (*Lat.* $0^\circ 49' S.$, *Long.* $130^\circ 54' E.$) is only suitable for small vessels when the reefs are plainly visible. Mesawai, an islet on the southern side of the bay, is surrounded by foul ground.

Charts 3744, 3745.

SALAWATI.—Anchorage.—Directions.—The greater part of this island is occupied by very low land, with jungle difficult to penetrate. The principal villages on the coast are Samate, on the north-eastern side, and Sailolof, on the south-western side, situated, respectively, 26 miles eastward and 18 miles south-south-eastward of Tandjoeng Dadi.

The islets lying off the west coast of Salawati are low, thickly covered with vegetation, and lie on long narrow ridges running parallel to the coast. On the outer ridge are the Kaboe eilanden, wooded with high trees, situated about $10\frac{1}{2}$ miles south-south-westward of Tandjoeng Dadi, and Loslos about 7 miles southward of them.

Chart 3744.

About 6 miles southward of Loslos (*Lat.* $1^\circ 16' S.$, *Long.* $130^\circ 36' E.$), is a stony patch, over which there is a depth of 16 feet (4^m9), and which, owing to the greenish colour of the water in this vicinity, is not well marked by discoloration.

The two Mokon eilandjes, Jef Danja and Gebroken eilanden (*see* view facing page 223), lie on the next ridge eastward, the northern portion of which is separated from Kaboe eilanden (*see* view facing page 232) by a deep channel. Farther inshore, are several other ridges with islets on them, also many detached shoal patches; the positions of all these can best be seen on the chart.

Charts 942b, 2759a, 1263.

Chart 3744.

Kampoeng Sailolof consists of a long row of houses on piles on the beach, with numerous coconut trees in the vicinity. Drinking water can be obtained from wells.

- 5 Anchorage may be obtained off this village, in a depth of 6 fathoms (11^m0), with the mosque bearing 054°, and the south-western extremity of Tjoen, an islet lying nearly one mile westward of the village, in line with Bodo, an islet, bearing about 292°.

- A vessel approaching from westward or south-westward can pass
10 close southward of Gebroken eilanden and then steer for Tjoen until the mosque bears 054°. A vessel from northward, after rounding Loslos, should bring that islet astern on a westerly bearing and steer for Oemien, an islet situated about 1½ miles west-south-westward of Tjoen, passing well southward of it, and thence steer for the mosque
15 in Sailolof, bearing 054°.

- Outlying islands and dangers.**—Noesela eilanden consist of a group of islands, the largest of which is Weeim or Babi, lying about 12 miles north-north-westward of the northern extremity of Misool. The position of the shoals in the vicinity of these islands may best be
20 seen on the chart.

Schildpad eilanden are a group of eight low islands, densely wooded with high trees, lying about 15 miles north-north-eastward of the northern extremity of Misool. The outer islets should be given a berth of at least 2 miles.

- 25 Hesketh shoal, with a depth of 16 feet (4^m9) over it, stones, lies about 3½ miles south-westward of Kamoeai, the westernmost island of the group, and a 16-foot (4^m9) patch lies about 3 miles farther south-westward.

- Doea eilanden consist of two islets thickly covered with high trees and
30 fringed by a reef, lying about 5 miles south-south-eastward of Schildpad eilanden. A 4-fathom (7^m3) patch lies about 2 miles westward of the northern of the Doea eilanden. Magdal reefs are two dangerous reefs, which can seldom be discerned by discoloration, with a least depth of 6 feet (1^m8) over them, lying about 4 miles north-north-
35 eastward of Doea eilanden.

Zeemeeuw reefs (*Lat. 1° 20' S., Long. 130° 30' E.*), situated about 12 miles westward of Gebroken eilanden, dry only at low water, when there is frequently surf over them. The tidal streams in this vicinity are irregular.

- 40 *Charts 1416, plan of Straat Sele, 3744.*

STRAAT SELE.—This passage between Salawati and the western extremity of New Guinea, is frequently used; navigation in it presents no difficulty. The principal routes through Straat Sele were swept in 1951.

- 45 All the islands in the strait, except Ram, Tsiof and Doom, situated at the northern end of the strait, Matan and Warir on the western side and Saloetoen Genan, Saloetoen Pele and Saplap at the southern end are low, but are covered with high trees. The shores of the strait are low and wooded. The reefs are only slightly marked by dis-
50 coloration. On the north-eastern side of Salawati are the deserted villages of Waiwo and Samate, and on the southern side, situated about 2 miles north-westward of Tandjoeng Kamjolo, the western entrance point, is Kampoeng Saileen. On the New Guinea coast

Charts 3745, 3242, 942b, 2759a, 1263.

Charts 1416, plan of Straat Sele, 3744.

are Kampoeng Seget, situated about 3 miles north-eastward of Tandjoeng Sele, a rocky point, about 30 feet (9^m1) high, covered with high trees, the eastern entrance point of the southern end of the strait, and Kampoeng Kasim, situated about 6 miles farther northward 5 abreast Jef Kasim.

Tidal streams.—Close northward of Segaru light (page 232) the tidal stream is of mixed characteristic with the semi-diurnal stream predominating. The average maximum rate in this area is about 2 knots but there is a current setting in a north-north-easterly direction 10 at a rate of about a quarter of a knot.

Chart 1416, plan of Straat Sele.

Rede Samate and approaches.—**Anchorage.**—This roadstead, situated northward of Kampoeng Samate, lies between Tandjoeng Majasalava and Rombombo eilanden, eastward of it. Bam is a 15 high rocky islet lying on the outer edge of a drying reef which extends from Salawati, about 2½ miles south-eastward of Tandjoeng Majasalava. Katapatjan, a rock above water, lies on the eastern side of the roadstead, on the edge of the extensive drying reef, which extends from the western side of Rombombo eilanden. 20

There are several reefs in the northern approach to Rede Samate, the positions of which may best be seen on the chart.

Anchorage may be obtained, in a depth of 39 feet (11^m9), hard bottom, about 7 cables eastward of Bam. A vessel approaching from northward, should steer for Matan, an islet, 279 feet (85^m0) high, 25 which lies about 2½ miles south-eastward of Jefman, the north-eastern of the Rombombo eilanden, bearing 180°, until Tandjoeng Sorong, the eastern entrance point of the northern end of Straat Sele, bears 090°, when she should steer for Jef Doif (page 224), bearing about 241°. When Bam bears about 169°, she should steer for it 30 on that bearing until Katapatjan is in line with the north-eastern extremity of the southern of the Rombombo eilanden, bearing 097°, when she should alter course gradually eastward and anchor when Katapatjan is in line with the southern extremity of Jefman, bearing about 086°. The detached reef, with a depth of 16 feet (4^m9) over it, 35 situated about 1½ miles east north-eastward of Bam, is marked by discoloration and slight breakers. (*Lat. 0° 56' S., Long. 131° 05' E.*).

There is always a north-easterly swell in the roadstead, so that vessels may roll heavily even in the finest weather.

There is a T-headed pier on the south-eastern side of Jefman; in 40 1950 there were depths of 7 and 12 feet (2^m1 and 3^m7) alongside the northern and southern ends of its head, respectively.

Kampoeng Samate, which is deserted, consists of dwellings on piles. *Chart 1416, plans of Straat Sele and Rede Sorong.*

Rede Sorong and approaches.—**Lights.**—**Beacons.**—**Dangers.** 45 —**Buoyage.**—**Pilotage.**—This roadstead is situated on the eastern side of Straat Sele, about 4 miles southward of Tandjoeng Sorong. Sorong Doom, the headquarters of a Government official, is situated on the eastern side of Doom, an islet 126 feet (38^m4) high, lying about half a mile south-south-westward of Tandjoeng Noejew, situated 50 3½ miles southward of Tandjoeng Sorong. There are two small piers at the village. Sorong Doom also includes the village of Sorong situated, on the mainland, by Tandjoeng Noejew.

In 1951 the population was reported to be between two and three

Charts 3745, 942b, 2759a, 1263.

Chart 1416, plans of Straat Sele and Rede Sorong.

thousand natives and from two to three hundred Europeans, the latter being mostly employed by an oil company.

There is a Harbour Master.

- 5 The limits of the roadstead are the parallels of Lat. $0^{\circ} 50'$ and Lat. $0^{\circ} 58'$ S. and the meridian of Long. $131^{\circ} 11'$ E., and are indicated on the chart.

Pilotage waters are limited to the roadstead; but vessels arriving at night may anchor, till next morning between the outer light-buoy

- 10 and Dopier to await the arrival of a pilot.

Ram, an island, 214 feet (65^m2) high, lying about a mile south-westward of Tandjoeng Sorong, is covered with high trees on its western side; on the eastern side there are some trees of a peculiar shape. On the reef, which dries, extending from the northern side of the island

- 15 are three islets covered with growth, and a reef, on which there are some low black rocks, extends about $1\frac{1}{4}$ miles westward of the islands.

Chart 1416, plan of Rede Sorong.

- Tsiof is a wooded island 175 feet (53^m3) high, situated about $2\frac{1}{4}$ miles southward of Ram. Close off its south-western side are some rocks
- 20 above water, and off its northern side, the shore reef extends $2\frac{1}{4}$ cables, with three detached reefs marked by discoloration outside it. The north-eastern of these reefs, with a depth of 11 feet (3^m4) over it, situated about 8 cables north-westward of the northern extremity of Tsiof, is marked by a spherical light-buoy, painted black with a cone
- 25 topmark, exhibiting a green flashing light showing a short flash every five seconds.

A detached 5-foot (1^m5) patch lies about half a mile east-north-eastward of the northern end of Tsiof.

- Two rocks awash, lie about $3\frac{1}{2}$ cables south-eastward and 4 cables
- 30 south-south-eastward of the northern extremity of Tsiof and about $2\frac{1}{2}$ and $1\frac{1}{2}$ cables offshore.

The channel, nearly $1\frac{1}{2}$ miles wide, between Tsiof and Nanah, an island lying about $8\frac{1}{2}$ cables southward of Doom, is encumbered with scattered dangers, the positions of which may best be seen on the chart;

- 35 the same remarks apply to the channel between Nanah and Doom; neither channel should be attempted without local knowledge.

Chart 1416, plan of Straat Sele.

A light is exhibited, at an elevation of 98 feet (29^m9), from a white iron framework structure, 49 feet (14^m9) in height, on Tandjoeng Sorong.

- 40 *Chart 1416, plan of Rede Sorong.*

A light is exhibited, at an elevation of 36 feet (11^m0), from a white iron framework structure, 33 feet (10^m1) in height, on the south-western end of Tsiof (Lat. $0^{\circ} 54'$ S., Long. $131^{\circ} 11'$ E.).

- A light is exhibited, at an elevation of 21 feet (6^m4), from a white
- 45 iron framework structure, 16 feet (4^m9) in height, on Dopior, an islet lying on the edge of the coastal reef about $1\frac{1}{4}$ cables westward of Tandjoeng Noejew.

A light is exhibited, at an elevation of 113 feet (34^m4), on the northern side of Doom.

- 50 Leading lights are exhibited east-south-eastward of Tandjoeng Noejew; the front light at an elevation of 21 feet (6^m4), from a white iron framework structure, 16 feet (4^m9) in height, standing on the edge of the shore reef about $1\frac{1}{4}$ miles east-south-eastward of Tandjoeng Noejew; the rear light, at an elevation of 196 feet (59^m7), from a

Charts 3745, 942b, 2759a, 1263.

Chart 1416, plan of Rede Sorong.

beacon surmounted by a white diamond, 33 feet (10^m1) in height, situated about 2½ miles east-south-eastward of Tandjoeng Noejew.

Two shoals, with depths of 20 and 10 feet (6^m1 and 3^m0) over them, lie respectively, about 3 cables eastward and 8½ cables east-north-eastward of the light-structure on Doom and a 3-fathom (5^m5) depth lies nearly half a mile westward of the light-structure.

There is no passage between Tandjoeng Noejew and Dopior.

A reef, which dries, lies about half a mile southward of the front leading light-structure described above. A stranded wreck, and a 10 beacon, surmounted by a cylinder, marks this reef.

Shoals, with depths of 5 and 7 feet (1^m5 and 2^m1) over them, lie about 8 and 10 cables south-south-eastward, and a patch, with a depth of one foot (0^m3) over it, lies about 3½ cables south-eastward of the front leading light-structure. 15

Moe, an islet, lies about 9 cables south-eastward of Nanah at the north-eastern end of a large reef which extends about 1½ miles southward and on which also lie the islands of Vandoe and Ombree, south-eastward.

The southern entrance channel to Rede Sorong lies between Moe 20 and Nanah and the dangers off them.

Chart 1416, plan of Straat Sele.

A small detached reef, lying about 1½ miles south-westward of Moe constitutes the outer danger on the eastern side of the entrance channel.

Chart 1416, plan of Rede Sorong.

A beacon, surmounted by a white cylinder, standing on a one-foot (0^m3) patch, marks the eastern edge of the channel nearly half a mile west-south-westward of Moe; from the beacon the channel is fringed, southward, by a drying reef and north-eastward by a chain of shoal heads and reefs for a distance of about one mile. A shoal, 30 with depths of from 16 to 18 feet (4^m9 to 5^m5) over it, lies about three-quarters of a mile north-north-eastward of Moe, with foul ground about 2 and 4½ cables south-eastward of it.

Foul ground, with depths of less than 6 feet (1^m8) over it, extends about 2½ cables south-eastward and southward, and a shoal, with a 35 least depth of 24 feet (7^m3) over it, lies about 2½ cables south-south-eastward of the southern extremity of Nanah; a rock awash and a 9-foot (2^m7) shoal lie about 3½ and 5½ cables south-south-westward of the same extremity and are the outer dangers on the western side of the southern entrance; a drying reef, marked by beacons, extends 40 about 3½ cables south-westward from the southern end of Nanah (*Lat. 0° 55' S., Long. 131° 14' E.*).

A beacon surmounted by a black cylinder stands at the edge of the fringing reef off the south-eastern side of Nanah, and marks the western side of the southern entrance channel. 45

A shoal, with a swept depth of 21 feet (6^m4) over it, lies in mid-channel about 5 cables eastward of the southern extremity of Nanah.

Two shoals, with depths of 14 and 23 feet (4^m3 and 7^m0) over them, lie on the southern side of the usual anchorage in Rede Sorong, and about 7½ cables east-north-eastward and 1½ miles eastward of the 50 northern extremity of Nanah; they have been swept to depths of 14 and 21 feet (4^m3 and 6^m4) respectively.

Eastward of Tandjoeng Noejew there are several piers and a wharf, the commercial pier, about 450 feet (137^m2) in length, with a depth

Chaits 3745, 942b, 2759a, 1263.

Chart 1416, plan of Rede Sorong.

alongside of 36 feet (11^m0); the oil pier, 56 feet (17^m1) in length, with a depth of 39 feet (11^m9) alongside, where fresh water and fuel oil may be obtained, lies about half a mile eastward of Tandjoeng Noejew.

5 A light, privately maintained, is exhibited from the root of the oil pier.

There are a number of mooring buoys in the vicinity of the oil pier and in the north-eastern part of the road.

There is a small slipway, with a mooring buoy close off it, situated at the eastern end of Karim, an islet which, with Toen an islet close
10 south-eastward, lies about 1½ miles north-eastward of Moe.

Anchorage.—Directions.—Anchorage may be obtained in Rede Sorong, in depths of from 11 to 14 fathoms (20^m1 to 25^m6), where there is a good navigable channel, though it is open southward, south-eastward of Doom. In the event of strong southerly winds a vessel may
15 shift to the northern side of the island. If remaining for some time, a vessel should moor on account of the strong tidal streams. During September, 1947, the maximum rate of the tidal streams was about one knot.

A vessel approaching Rede Sorong from northward should pass
20 westward of the black rocks lying westward of Ram, and, thence, steer to bring the leading lights, east-south-eastward of Tandjoeng Noejew, into line, bearing 102½°, passing northward of the 11-foot (3^m4) patch northward of Tsiof; keep the lights in line until the light-structure on the northern side of Doom bears 125°, when she
25 should haul slightly southward of the leading line and pass between Dopior and Doom; when the light-structure on the northern side of Doom bears 235°, course should be altered as necessary for the anchorage, passing between the 10- and 20-foot (3^m0 and 6^m1) shoals east-north-eastward of the head of the pier at Doom.

30 A vessel approaching from southward should steer to bring the floating dock, situated about 1½ miles eastward of Tandjoeng Noejew, bearing 036°, or at night, the front leading light, situated close westward of the dock, bearing 032½°. It should be noted that these lines lead close north-westward of the 21-foot (6^m4) patch which lies about
35 half a mile eastward of the southern point of Nanah. Care must be taken to avoid a 5-foot (1^m5) patch, not marked by discoloration, which lies about 2½ cables south-south-westward of the black beacon which stands off the eastern side of Nanah.

Radio station.—Signal station.—There is a radio station on
40 Doom. See page 5. There is a signal station on Tandjoeng Noejew (Lat. 0° 53' S., Long. 131° 14' E.).

Harbour facilities.—Fresh water and fuel oil are obtainable, but medical advice should be obtained regarding the potability of the water.

45 Provisions are scarce.

There is a tug, and a number of motor launches.

There are many mobile 5-ton cranes and one 10-ton crane on the commercial pier, and there are two 35-ton floating cranes.

There is a privately owned floating dock with a lifting capacity of
50 600 tons.

There is a small slipway.

There is a large hospital at Sorong.

There is an airfield on the island of Jefman; a weekly service to Biak (see *Pacific Islands Pilot*, Vol. I) is maintained.

Charts 3745, 942b, 2759a, 1263.

Charts 1416, plan of Straat Sele and 3744.

Southern entrance to Straat Sele and approaches.—Dangers.—Lights.—Beacon.—Anchorages.—A 3-fathom (5^m5) patch lies about $6\frac{1}{4}$ miles south-westward of Tandjoeng Sele, and a shoal, with a least depth of 23 feet (7^m0) over it, lies about 3 miles farther south-westward with depths of 19 feet (5^m8) between them. A bank, parts of which dry, extends about 4 miles south-south-eastward from Tandjoeng Sele, two 3-fathom (5^m5) patches lie about $3\frac{1}{4}$ and 5 miles southward of that point; both patches have been swept over; a 19-foot (5^m8) patch lies about 6 miles south-south-eastward of the point; other depths, of less than 5 fathoms (9^m1), lying in the vicinity can best be seen on the chart.

For dangers farther eastward, *see* page 236. In the western approach, southward and south-eastward of Gebroken eilanden, there are three patches with depths of from 16 to 18 feet (4^m9 to 5^m5) over them, within a distance of 5 miles of that group.

Membok, a low islet, lies on the western side of the entrance, about $1\frac{1}{4}$ miles north-westward of Tandjoeng Sele, and shoals, with depths of from 13 to 18 feet (4^m0 to 5^m5) over them, lie within one mile south-westward of the islet.

A light is exhibited, at an elevation of 17 feet (5^m2), from a white iron framework structure, 16 feet (4^m9) in height, on Membok.

Oempe light is described on page 236.

A light is exhibited, at an elevation of 10 feet (3^m0), from a white structure, 8 feet (2^m4) in height, at Kampoeng Wiljam, situated on the western side of the strait about 9 miles north-north-eastward of Membok.

Anchorage may be obtained, in a depth of about 12 fathoms (21^m9), on the eastern side of Jef Kasim. It may be approached from northward or southward; an unofficial beacon marks a small drying reef lying near the mainland of the entrance to the southern approach channel. There is a pier at the settlement.

Good anchorage may be obtained, in depths of from about 6 to 9 fathoms (11^m0 to 16^m5), hard bottom, during the West monsoon, eastward of Peli, an islet situated on the western side of the entrance, about $1\frac{1}{4}$ miles north-north-eastward of Membok; also eastward of Loego, an islet situated about half a mile westward of Kampoeng Seget, during the East monsoon, in a depth of about 14 fathoms (25^m6), mud and sand. Kampoeng Seget is the headquarters of a native Government official; there is a pier here, with a depth of 5 feet (1^m5) at its head.

Directions.—A vessel approaching the southern entrance to Straat Sele should keep the western extremities of Membok and Peli in line, bearing about 011° until the southern side of Tandjoeng Sele (*Lat.* $0^\circ 26'$ S., *Long.* $130^\circ 56'$ E.) bears 090° , thence she should keep in mid-channel through the narrows.

Chart 1416, plan of Straat Sele.

Straat Sele. — Lights. — Dangers. — Beacons. — Buoyage. — A beacon marks Tandjoeng Waifkalettet, situated at the northern end of the eastern side of the narrows.

A light is exhibited, at an elevation of 34 feet (10^m4), from a white iron column surmounted by a white inverted triangle, 33 feet (10^m1) in height, situated on the western end of Kamoomjel, an island which lies about 3 miles east-north-eastward of Tandjoeng Waifkalettet.

Charts 3745, 942b, 2759a, 1263.

Chart 1416, plan of Straat Sele.

A beacon marks Jef Nanas, an islet which lies about $2\frac{3}{4}$ miles north-eastward of Tandjoeng Waifkalettet.

A light is exhibited, at an elevation of 10 feet (3^m0), from a white column, 8 feet (2^m4) in height, on a drying reef which lies close north-westward of Oenaginim, situated about 3 miles north-north-eastward of Kamoomjel light-structure. Shoals, with depths of less than 5 fathoms (9^m1) over them extend northward of this light-structure.

10 A light is exhibited, at an elevation of 11 feet (3^m4), from a white column, 8 feet (2^m4) in height, situated on a reef which extends about 2 cables northward from Segarau, which lies about 4 miles north-north-eastward of Kamoomjel light-structure; these two light-structures are in line bearing $195\frac{1}{2}^\circ$. Shoals, with depths of one and 3 fathoms (1^m8

15 and 5^m5) over them, lie about 5 cables east-north-eastward and $2\frac{1}{4}$ cables north-eastward, respectively, of Segarau light-structure; the one-fathom (1^m8) shoal is marked by a black and white chequered can buoy with a radar reflector. Shoals, with depths of 23 and 25 feet (7^m0 and 7^m6) over them, lie close westward and eastward, respectively, of the leading line about $2\frac{3}{4}$ miles northward of Segarau light-structure.

A light is exhibited, at an elevation of 50 feet (15^m2), from a white iron framework structure surmounted by a white inverted triangle, 49 feet (14^m9) in height, situated on the reef close westward of Wolo Genan, an islet which lies about $4\frac{1}{4}$ miles east-north-eastward of Segarau light-structure.

A light is exhibited, at an elevation of 19 feet (5^m8), from a white column 8 feet (2^m4) in height, situated on the north-eastern extremity of Balbili (*Lat. $1^\circ 06' S.$, Long. $131^\circ 10' E.$*), and about $3\frac{1}{4}$ miles northward of Wolo Genan.

30 A light is exhibited, at an elevation of 11 feet (3^m4), from a white pillar, 8 feet (2^m4) in height, situated on the south-eastern point of Bolke, an islet, which lies about one mile westward of Balbili light-structure.

Three shoals, with depths of from 13 feet to 4 fathoms (4^m0 to 7^m3) over them, lie between 4 cables north-westward and 7 cables northward of Balbili light-structure. A shoal, with a depth of 5 fathoms (9^m1) over it, lies about $3\frac{1}{4}$ cables north-eastward of the light-structure.

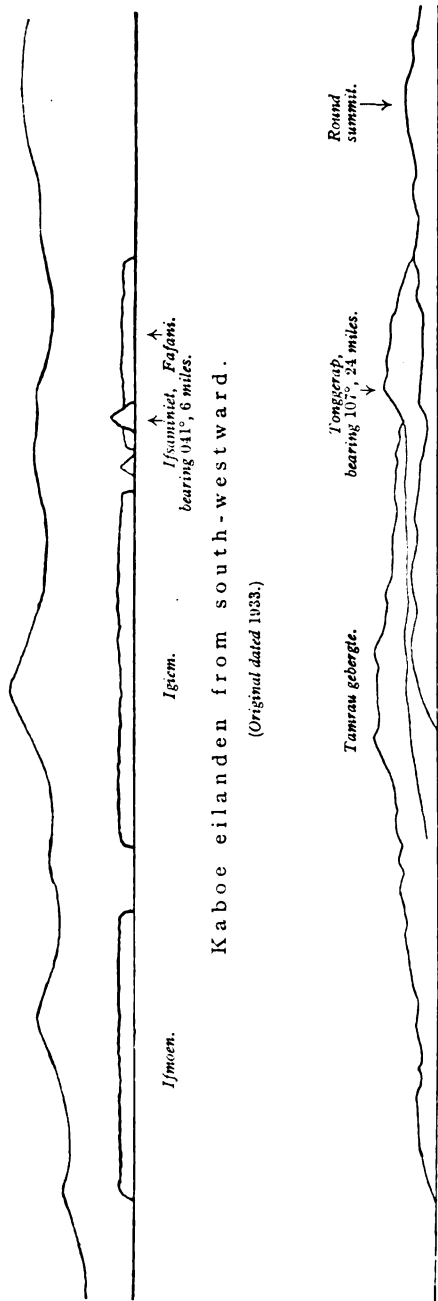
A beacon, surmounted by a white ball marks a rock with a depth of 3 feet (0^m9) over it, situated about 3 miles north-north-eastward of Balbili light-structure. A 26-foot (7^m9) detached patch lies about $3\frac{1}{4}$ cables south-eastward of this beacon.

A reef, with a depth of 7 feet (2^m1) over it, is marked by a spherical light-buoy, painted red with a can topmark, and exhibiting a *white flashing light every five seconds*, which lies about 5 miles northward of Balbili light-structure.

Two shoals, each with a depth of 11 feet (3^m4) over it, lie about 2 miles south-eastward and south-south-eastward of Matan, and a 13-foot (4^m0) patch lies about 6 cables northward of Kasiem (page 223).

Directions.—After passing Tandjoeng Waifkalettet, situated on the eastern side of the northern end of the narrows, and marked by a beacon, a vessel should steer to pass eastward of Jef Nanas, which lies about $2\frac{3}{4}$ miles north-eastward, and is also marked by a beacon, thence eastward of Saloetoe Genan, which has higher trees on it than the adjacent islands, westward of the light-structure which stands on the

Charts 3242, 942b, 2759a, 1263.



North coast of New Guinea.—Tamrau gebergte from west-north-westward.
(Original dated 1933.)



North coast of New Guinea.—Mios Soc from south-south-eastward.
(Original dated 1933.)



North coast of New Guinea.—Kaap de Goede Hoop from westward.

(Original dated 1933.)

Kaap de Goede Hoop, bearing 254°, 20 miles.

North-coast of New Guinea.—Kaap de Goede Hoop from east-north-eastward.

(Original dated 1933.)

↑ S. entrance point of Patipri baai, bearing 093°, 12 miles.
 ↑ W. entrance point of Salakiti baai.
 ↑ W. entrance point of Telok Tavar.

Southern side of McCluer golf from northward of Tandjoeng Fatagar.

(Original dated 1933.)

Chart 1416, plan of Straat Sele.

reef off Oenaginim, situated about half a mile eastward of Saloetoen Genan; thence eastward of Segarau, from the northern side of which a reef, which dries, marked by a light-structure near its extremity, extends about 2 cables northward; and westward of the one fathom (1^m8) patch situated about half a mile east-north-eastward of the light-structure. Thence she should bring Kamoomjel and Segarau light-structures or the eastern extremities of Segarau and Saloetoen Genan in line astern, bearing $195\frac{1}{4}^{\circ}$, until Mehil, an islet situated about $4\frac{1}{2}$ miles north-eastward of Segarau, bears 100° , when she should steer about 057° , which leads between the islands Balbili and Kabra Bemoek. When Balbili and Wolo Genan light-structures are in line bearing 180° , the vessel should alter course northward and keep this alignment on astern, which leads clear of all dangers, passing eastward of an unofficial beacon marking the northern end of a reef, which dries, about one mile north-eastward of the northern end of Kabra and westward of the beacon marking the rock with a depth of 3 feet (0^m9) over it, and the light-buoy, painted red, described above; thence she should pass out of the northern end of the strait between Rombombo eilanden and Tsiof.

The route southward of Balbili should be taken by vessels with a draught of 13 feet (4^m0) and more. If bound for Rede Sorong the vessel should continue with Balbili and Wolo Genan light-structures in line astern until the floating dock bears 036° and then proceed as described in the directions for Rede Sorong.

There are several other routes which vessels can take through Straat Sele. Instead of passing between Balbili and Kabra Bemoek, a vessel can proceed through Sangoilin Mon or Heilige straat, between Kabra and Warir, by keeping in mid-channel, and when well past the eastern point of Batimee, situated on the south-eastern side of Warir, she should keep this point in line astern with the northern of the Sobrain eilandjes, bearing about 198° , which leads westward of the 4-foot (1^m2) reef, situated westward of the northern part of Kabra; when the northern extremity of Kabra bears 090° , she should steer north-eastward and pass south-eastward of the two shoals, with depths of 11 feet (3^m4) over them, situated about 2 miles south-eastward of Matan. When the light-structures of Balbili and Wolo Genan are in line, bearing 180° , she should alter course northward and proceed as previously directed with these marks in line astern.

Small vessels with local knowledge may take the route along the Salawati coast, passing westward of Jef Mo (*Lat. $1^{\circ} 13' S.$, Long. $131^{\circ} 03' E.$*), and thence northward through Straat Lenna, between Salawati and Warir; the northern entrance is marked by three unofficial beacons.

The headquarters of the Rajah of Salawati are on Kasiem, an islet situated close off the north-eastern end of Warir, and about $6\frac{1}{2}$ miles south-westward of the southern entrance to Rede Sorong.

Anchoragees.—Anchorage may be obtained as convenient almost anywhere in the strait. Anchorage may be obtained by a vessel of moderate draught, with local knowledge, eastward of Makmak, an island, which lies on the eastern side of the strait, about $2\frac{1}{2}$ miles south-eastward of Balbili; the anchorage may be approached from northward or southward, but there are a number of dangers in both approaches, the positions of which may best be seen on the chart. There is a pier here, on the mainland.

Charts 3242, 942b, 2759a, 1263.

Chart 3745.

NORTHERN SIDE OF NEW GUINEA.—Coast.—Anchorage.

—Between Tandjoeng Sorong (page 227) and Kaap de Goede Hoop (chart 3248), which lies 79 miles east-north-eastward, the coast is mostly high. Between Tandjoeng Sorong and Tandjoeng Doré, which lies about 20 miles east-north-eastward, there are no outstanding landmarks, but the western spurs from the Tamrau gebergte, of which, Tonggerap or Grooté Olifant, 3,865 feet (1178^{m0}) high, which stands about 32 miles eastward of Tandjoeng Doré, is the most prominent, will usually be in sight. See view facing page 232.

Batoe Lobang, a heap of stones, 76 feet (23^{m2}) high, lies close offshore, about 12 miles east-north-eastward of Tandjoeng Sorong. About 1½ miles south-westward of this rock is the mouth of War Samson, off which a vessel may obtain temporary anchorage, in a depth of about 25 fathoms (45^{m7}), about ¾ cables offshore. The river can be entered by a power boat, but one mile within the mouth the current is too rapid for further navigation.

The following mountains stand near the coast:—Morait, 1,424 feet (434^{m0}) high, about 2½ miles south-westward of Tandjoeng Doré; Olifant, 1,539 feet (469^{m1}) high, about 20 miles eastward of Tandjoeng Doré and nearly 2 miles inland; a mountain with a round summit, 1,674 feet (510^{m3}) high, about 2½ miles eastward of Tandjoeng Sawasar, situated about 23 miles east-north-eastward of Tandjoeng Doré; and an equally round-topped hill about one mile within Tandjoeng Kasbi, situated about 6 miles north-eastward of Tandjoeng Sawasar.

Behind this coastal hilly land, and separated from it by the valley of War Samson, which runs east and west, is a high ridge of mountains which extends eastward to join the massive Tamrau gebergte, the summits of which are nearly always enveloped in clouds.

Doré Hoem baai.—Anchorage.—Doré Hoem baai, entered between Tandjoeng Doré and point which lies about 2½ miles south-eastward, affords anchorage, in a depth of about 15 fathoms (27^{m4}), sheltered from the northerly swell, southward of Kampoeng Makebon, situated about one mile southward of Tandjoeng Doré. Foul ground extends 1½ miles eastward from Tandjoeng Doré. Hoem, which lies on the eastern side of the entrance, is a low islet with high trees on it, from which foul ground extends about 1½ miles north-north-eastward and about one mile westward. There are several detached shoals in the bay, the positions of which may best be seen on the chart.

Kampoeng Saoesot is situated on the creek of the same name about 1½ miles south-eastward of Hoem, and Kampoengs Bawé and Mabi stand on the southern shore of the bay.

Coast.—Light.—Anchorages.—Tandjoeng Asi, which lies about 10 miles eastward of Tandjoeng Doré, can be identified by a mountain, 1,802 feet (549^{m2}) high, which stands close within it and slopes steeply to the sea. Kampoeng Asbakin is situated at the mouth of a creek about 1½ miles westward of Tandjoeng Asi.

About 12½ miles eastward of Tandjoeng Asi (*Lat.* 0° 44' S., *Long.* 131° 42' E.) is Rede Mega, situated off Kampoeng Mega, which stands on the western side of the mouth of Sungei Mega, the valley of which is a remarkable break in the otherwise continuous line of coastal hills; the coast becomes steep again at Tandjoeng Sawasar, situated about 1½ miles northward.

A bank, with depths of from ¾ to 5 fathoms (5^{m9} to 9^{m1}) over it,

Charts 3242, 942b, 2759a, 1263.

Chart 3745.

sand and mud, extends about $1\frac{1}{2}$ miles offshore at Mega and the coast westward of it. On the outer edge of the bank are some drying patches, which partially shelter the roadstead, and about a quarter of a mile outside the westernmost patch there is a dark-coloured 5 rock above water, which is conspicuous. A $2\frac{1}{2}$ -fathom (4^m6) patch lies about $2\frac{1}{2}$ miles westward of Tandjoeng Sawasar.

Charts 3745, 3248.

Between Tandjoeng Sawasar and Tandjoeng Sansapor, which lies 16 miles north-eastward, the coast is fairly steep-to, and anchorage 10 may be obtained in favourable weather almost anywhere, in depths of from $6\frac{1}{2}$ to 8 fathoms (11^m9 to 14^m6).

Chart 3745.

A shoal, with a depth of $1\frac{1}{2}$ fathoms (2^m7) over it, lies nearly $2\frac{1}{2}$ miles northward of Tandjoeng Kasbi, situated 6 miles north-eastward 15 of Tandjoeng Sawasar.

A drying reef extends a quarter of a mile offshore about $1\frac{1}{2}$ miles east-north-eastward of Tandjoeng Kasbi; three drying rocks lie about $1\frac{1}{2}$ miles further east-north-eastward.

Chart 3248.

20

Between Tandjoeng Sansapor and Kaap de Goede Hoop, which lies about 21 miles east-north-eastward, the coast is high, steep spurs sloping down from Tamrau geberge.

Mios Soe consist of two low coral islands, Amsterdam and Middleburg, covered with high trees, and each fringed by a reef, lying $2\frac{1}{2}$ miles 25 offshore, about $8\frac{1}{2}$ miles north-eastward of Tandjoeng Sansapor (see view facing page 232). The passage between Middelburg and the coast is clear of dangers except for a 21-foot (6^m4) patch lying about $1\frac{1}{2}$ miles eastward of the southern part of Middelburg. There is a boat pier on the southern side of Middelburg; there are coconut plantations 30 on both islands.

A light is exhibited, at an elevation of 59 feet (18^m0), from an iron framework structure, 54 feet (16^m5) in height, which stands on Amsterdam.

Sansapor Baroe and Weroer are two villages situated about $5\frac{1}{2}$ and 35 7 miles east-north-eastward of Tandjoeng Sansapor; a flagstaff at Weroer, where fresh fruit is abundant, indicates the landing place.

Between Tandjoeng Opmarai, which lies $11\frac{1}{2}$ miles north-eastward of Tandjoeng Sansapor, and Kaap de Goede Hoop, the coast is fringed by a bank, with depths of from about 5 to 10 fathoms (9^m1 to 18^m3), 40 over which anchorage may be obtained during the South-east monsoon; in the North-west monsoon there are heavy rollers on it. Depths of 3 fathoms (5^m5), or less, extend about $1\frac{1}{2}$ miles north-north-eastward from Tandjoeng Opmarai. About $4\frac{1}{2}$ miles eastward of Tandjoeng Opmarai is the mouth of Sungei Kor, on the eastern side of which there 45 is a good landing place when there is an easterly swell. Landing can also be effected during an easterly swell under the lee of some coastal rocks, near some dwellings eastward of the entrance. There is a rock covered with vegetation close off these dwellings. This river can be entered by a powerboat at high water, but is only navigable for about 50 three-quarters of a mile above its mouth.

Kaap de Goede Hoop or Tandjoeng Jamoersba (*Lat.* $0^\circ 21' S.$, *Long.* $132^\circ 25' E.$), the northern extremity of New Guinea, is steep-to, and can be identified by some yellow stripes on it, and when

Charts 3242, 942b, 2759a, 1263.

Chart 3248.

approaching it, a small lower cape will be seen projecting at right angles from it, *see* views facing page 233.

For coast eastward, *see* Pacific Islands Pilot, Vol. I.

5 Chart 3744.

- WESTERN SIDE OF NEW GUINEA.—Coast.—Light.—**The coast between Tandjoeng Sele (page 227) and Tandjoeng Sabra (chart 3743), which lies about 96 miles south-eastward, is generally low and densely wooded, and consequently there are few landmarks. There is, however, some higher land at Tandjoeng Jamtoep, situated 31 miles eastward of Tandjoeng Sele, which can be distinguished from off Jef Joes (*see* below). Extensive mudbanks, which dry in places, extend a considerable distance offshore, and coral and sand patches, which dry, lie on and near the edge of the coastal mud flat.
- 15** The coast between Tandjoeng Sele and Tandjoeng Wamonket, which lies about 18 miles east-south-eastward, is covered with high trees; the former point is distinctive from southward and the latter from westward. Oempe is an islet lying about one mile south-south-westward of Tandjoeng Kaledoko, situated about 4 miles east-south-eastward of
- 20** Tandjoeng Sele. Joes Genan, an islet fringed by a reef, lies about 2 miles west-north-westward of Tandjoeng Wamonket, and one mile offshore, with a depth of 8 feet (2^m4) between it and the coast.

A light is exhibited, at an elevation of 33 feet (10^m1), from a white iron structure, 33 feet (10^m1) in height, on the western extremity of

25 Oempe. (*Lat.* $1^{\circ} 29' S.$, *Long.* $130^{\circ} 59' E.$).

- Off-lying islet and dangers.—Light.—**A shoal, with a depth of 49 feet (14^m9) over it, the position of which is approximate, was reported, in 1951, to lie about 15 miles south-westward of Tandjoeng Sele (page 227). A rock, with a depth of less than 6 feet (1^m8) over it, lies about $4\frac{1}{2}$ miles south-eastward of Tandjoeng Kaledoko and 3 miles offshore. A shoal, with a depth of 11 feet (3^m4) over it, lies 5 miles south-westward of Joes Genan, with other shoals and a drying rock between them. Jef Joes, a low islet with high trees, lies about 14 miles south-south-westward of Tandjoeng Wamonket; it is fringed
- 35** by a reef, which is not marked by discoloration. A shoal, with a least depth of 23 feet (7^m0) over it, lies about 8 miles west-south-westward of Jef Joes. Shoals, with depths of 26 and 29 feet (7^m9 and 8^m8) over them, lie about 12 and $14\frac{1}{2}$ miles north-westward of Jef Joes. Two shoals, with depths of 18 and 23 feet (5^m5 and 7^m0) over them, lie
- 40** respectively, about 7 and $8\frac{1}{2}$ miles north-westward of Jef Joes. A rock, with a depth of less than 6 feet (1^m8) over it, and a 9-foot (2^m7) patch lie respectively, about $6\frac{1}{2}$ and 9 miles north-north-westward of Jef Joes. A patch, which dries, lies about 6 miles south-south-eastward of Tandjoeng Wamonket.
- 45** A light is exhibited, at an elevation of 30 feet (9^m1), from a red iron structure, 33 feet (10^m1) in height, on the north-eastern extremity of Jef Joes.

Caution.—Caution is necessary when approaching the mouths of the rivers between Tandjoeng Sele and Tandjoeng Sabra (chart 3743) as the channels are constantly changing. The Dutch Sailing Directions state that no reliance can be placed on charts of this locality that are more than one year old. The following remarks concerning the rivers on this coast were compiled in 1911.

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

Coast.—Anchorage.—Segoen baai, entered between Tandjoeng Wamonket and the conspicuous Tandjoeng Jamtoep, is encumbered with shoals, and its shores are fringed with wide banks which dry. Kobalin, a small island, lies about 4 miles eastward of Tandjoeng Wamonket, on one of the several detached low water banks. Four rivers flow into the bay. A channel, with a least depth of 19 feet (5^m8) in it, leads southward from the bay between banks which dry, but it can only be reached over a bank with a least depth of 6 feet (1^m8) over it.

Segoen rivier flows into the western side of Segoen baai. It was ascended in 1911 for a distance of about 8 miles, and anchorage was obtained off Wasop rivier, a tributary which flows into the western bank. The river was deep as far as this point, but a short distance farther there was a rock which was difficult to pass, 3 miles above which the river was about three-quarters of a cable wide. The banks, except in a few places, were low and covered with vegetation. The stinging gnats are very troublesome. Beraoer rivier is entered between Tandjoeng Jamtoep and Sille Sebak. Extensive banks, which dry, extend from the western side of the mouth of Beraoer rivier and from the coast between the mouths of these rivers. A bank, which dries, in the entrance of Beraoer rivier divides it into two channels, in the western of which there is a least depth of 5 feet (1^m5), and in the eastern, 8 feet (2^m4). In the approach, there are depths of from 6 to 8 feet (1^m8 to 2^m4) over the coastal bank. Jef Matel, a low islet, lies close within the south-eastern extremity of the bank which extends south-eastward from Tandjoeng Jamtoep (*Lat.* 1° 31' S., *Long.* 131° 26' E.).

The river has been ascended for a distance of about 25 miles to a point where it is formed by the confluence of the rivers Merarin and Giliwolo; there it is about a quarter of a cable wide, with a depth of about 7 fathoms (12^m8) in it. Merarin rivier flows from northward, and by following it, mountainous country would probably be reached in a short distance. Giliwolo rivier appears to run in an easterly and westerly direction. Karabra rivier was reached through Sille Djamka and Fagoe rivier.

Off-lying islet and dangers.—Jef Jal, which lies about 9 miles southward of Tandjoeng Jamtoep, is low and fringed by a reef, which is not marked by discoloration. There are several reefs in the vicinity, and many shoals, with depths of from 6 to 18 feet (1^m8 to 5^m5) over them, which are seldom marked by discoloration, lie from about 14 to 27 miles south-eastward of Jef Jal, the positions of which may best be seen on the chart.

Coast.—Karabra rivier has two mouths, the eastern and principal of which is shallow; the western, named Sille Sebak, is about 8 cables wide near its mouth, and maintains a width of more than a quarter of a mile to its junction with the Samesan, situated about 4 miles from the entrance, above which it narrows. A bank, which dries, lies about 3 miles south-westward of the western entrance point of Karabra rivier.

Sille Sebak is only accessible for small craft, as there are depths of from only 3 to 9 feet (0^m9 to 2^m7) on the coastal bank; there is a large drying bank in the approach to this river.

Karabra rivier has a width of over 2 cables where Sille Sebak

Charts 3242, 942b, 2759a, 1263.

Chart 3744.

branches off, but about 4 miles higher up, where Fagoe rivier enters through the right bank, it becomes narrower, and the depths, which have been from 4 to 7 fathoms (7^m3 to 12^m8), are more irregular. The lower reaches are easily navigable; above the mouth of Kelakais rivier a tributary on the left bank, situated about 6 miles above Fagoe rivier, the left bank should be avoided, on account of rocks on that side. The banks are low at first, and close along the river are sago trees. About 4 miles above Kelakais rivier, the river flows through a range of limestone hills, trending east and west, and about 300 feet (91^m4) high, which rise abruptly from the muddy land. The width of the river below the hills is about half a cable, but is less than half that width between the vertical banks. The current here is strong.

Seremoek rivier is entered between Tandjoeng Kakmela, which lies about 17 miles east-south-eastward of Tandjoeng Jamtoep, and Tandjoeng Seleboi, situated about 5 miles farther. A bank, which dries, extends about $1\frac{1}{2}$ miles from Tandjoeng Kakmela.

13561/63 Kaiboës baai, into which Kaiboës rivier and Maoewan rivier flow, is entered between Tandjoeng Seleboi and Tandjoeng Bakoi, situated 20 $5\frac{1}{2}$ miles south-eastward. It is encumbered in its entrance by an extensive bank, which dries, on the western side of which there is a channel, with depths of from 8 to 11 feet (2^m4 to 3^m4) in it, leading to Maoewan rivier, and on the eastern side a channel, with depths of from $2\frac{3}{4}$ to 5 fathoms (5^m0 to 9^m1) in it, leading to Kaiboës rivier. The least 25 depth, in 1938, on the outer bank just outside the latter channel, was about 7 feet (2^m1). On this bank high and low water occur from one to $1\frac{1}{2}$ hours earlier than in the mouth.

A vessel approaching from westward after passing Jef Jal should steer for Tandjoeng Sibaboe (*Lat. $1^{\circ} 44' S.$, Long. $131^{\circ} 54' E.$*), situated 30 about $3\frac{3}{4}$ miles south-south-eastward of Tandjoeng Bakoi, bearing 091° , until the eastern rounded bank of Kaiboës rivier bears about 041° , when she should steer 059° , which leads across the bar just outside the eastern channel. Beacons are placed by the natives along the edges of the banks on each side of the channel, but they must be given a good 35 berth. A vessel with local knowledge can safely proceed up the river until just westward of the large tributary near Ben, an island lying 5 miles above Kampoenng Konda. This village is the headquarters of a Government official.

Waromgè rivier is entered between Tandjoeng Sibaboe and 40 Tandjoeng Roemoninpori, situated about $5\frac{1}{2}$ miles southward. A wide bank extends from the coast here, and a shoal, which dries, lies about 4 miles westward of Tandjoeng Roemoninpori. The channel into the river leads between this point and the shoal, in a least depth of 19 feet (5^m8), and thence north-eastward along the southern bank. 45 The river was ascended, in 1911, for a distance of about 30 miles; the depths were found to be very irregular, but not less than 11 feet (3^m4) in any part. A short distance above the farthest point reached, the river divided into several small branches.

Animenroe rivier flows out between Kaiboës rivier and Waromgè rivier. 50 *Chart 3743.*

Three rivers, Metamani, Davoer, and Kais flow out between Tandjoeng Roer (Rur), situated 15 miles south-south-eastward of Tandjoeng Roemoninpori, and Tandjoeng Oeaim (Uaim), which lies about $2\frac{3}{4}$ miles southward. The river mouths can only be reached by

Charts 3242, 942b, 2759a.

Chart 3743.

small craft, with a draught of from 5 to 6 feet (1^m5 to 1^m8) at low water. A bank, with depths of from half a fathom to $1\frac{1}{2}$ fathoms (0^m9 to 3^m2), extends about 4 miles from the mouth. A vessel with local knowledge can reach the mouth of Metamani rivier which is the principal river of the delta, in a least depth of about $1\frac{1}{2}$ fathoms (3^m2). In the delta between the sand and mud flats there are depths of from $1\frac{1}{2}$ to 5 fathoms (3^m2 to 9^m1). Kais rivier is from $1\frac{1}{2}$ to nearly 4 cables wide and has depths of from $2\frac{1}{2}$ to 7 fathoms (4^m6 to 13^m7) between its marshy banks. Kampoen Jahadiang is situated about 6 miles from the mouth. The water in the Kais is fresh.

Chart 3744.

There is a wide, deep entrance to Metamani rivier, southward of the sand flats off the mouths of the other two rivers. The lower part of the river runs in a north-north-easterly direction through an extensive marshy district, and is nearly $1\frac{1}{2}$ cables wide, with depths of 5 fathoms (9^m1) in it. About 7 miles above Tandjoeng Oeaim the river makes a sharp bend south-eastward near Kampoen Moegem. Metamani rivier was explored for a distance of 6 miles, and depths of 6 fathoms (11^m0) were found up to that point, when the water still remained salt; the width of the river, however, was much reduced. The banks are everywhere low and covered with mangroves.

Approaching Metamani baai from westward Tandjoeng Winsop, situated $5\frac{1}{2}$ miles north-westward of Tandjoeng Roer, and Tandjoeng Oeaim are first sighted; the first-named point has a few scattered trees on it; thence to Tandjoeng Oeaim the coast is low, and on this point there are some high trees. Tandjoeng Roer is not seen until later, when it has the appearance of a steep headland with trees on it.

Sigaroi rivier is entered about 11 miles south-eastward of Tandjoeng Oeaim (*Lat. $2^{\circ} 05' S.$, Long. $132^{\circ} 01' E.$*). A mud and sand bank, with depths of from half a fathom to $1\frac{1}{2}$ fathoms (0^m9 to 2^m7) over it, lies off the entrance. In 1911, there was a least depth of $1\frac{1}{2}$ -fathoms (3^m2) in the entrance channel. Higher up, the river has depths of from $2\frac{1}{2}$ to $5\frac{1}{2}$ fathoms (5^m0 to 10^m1) in it, and is about one cable wide.

Chart 3743.

There are several tributaries, on the banks of which there are numerous dwellings on piles.

Tandjoeng Sabra lies about 23 miles south-eastward of Tandjoeng Oeaim.

MC CLUER GOLF.—This gulf, so named after Lieutenant Mc Cluer, who sailed up it in 1791, is known to the natives as Telok Beraoe. It is about 25 miles wide at its entrance between Tandjoeng Sabra and Tandjoeng Salakiti, narrowing to about 13 miles at the entrance to Golf van Bintoeni, which is the name given to the eastern end, and which continues eastward to within 16 miles of Geelvink baai, on the northern coast of New Guinea.

The shores are sparsely populated. Kampoen Kokas, situated in Baai van Sekar, on the southern side of the gulf, about 18 miles eastward of Tandjoeng Salakiti, is the principal trading place.

The depths are irregular, but except for some shoals in the approach to the large bight on the southern side, eastward of Baai van Sekar there are no dangers in the fairway.

The southern shore is moderately high and rocky as far eastward as

Charts 3242, 942b, 2759a.

Chart 3743.

Tandjoeng Goras, which lies about 17 miles east-south-eastward of Tandjoeng Sekar, the western entrance point of Baai van Sekar, elsewhere it is low and bordered by mangroves. The wide tongue of land 5 which terminates in Tandjoeng Fatagar, situated 13 miles south-westward of Tandjoeng Salakiti, attains an elevation of 3,518 feet (1072^m3), about 17 miles within the point, and is densely wooded, but has no conspicuous peaks. Elsewhere the mountains are so far inland on both sides of the gulf that they are of no use for navigation. Pisang 10 eilanden (page 248) are an excellent mark for making the gulf.

Tidal streams.—The tidal streams set regularly in and out of the gulf, setting in until the time of high water and out until the time of low water. The maximum rate, which was observed to be 2½ knots, occurs in the deep channels between the banks near the southern shore 15 eastward of Baai van Sekar. On the northern side, where the influence of several large rivers is felt at low water, the streams are very variable both in their direction and rate. In the rainy season the rivers discharge much discoloured water, which is sharply defined against the sea water for a considerable distance offshore.

20 **Climate.**—The climate over the whole of Mc Cluer golf is very agreeable. In the northerly monsoon, squalls combined with strong tidal streams make conditions difficult for small craft.

Northern shore of Mc Cluer golf.—**Light.**—**Beacons.**—The northern shore is bordered by extensive low marshy land, within which 25 the mountain ranges begin. Tandjoeng Sabra is distinctive from north-westward on account of its high casuarina trees, with a sandy beach in front of them, in place of the usual mangroves in the water by which these low coasts are almost always bordered, but if approaching it from between west and south, it is difficult to distinguish the clump of trees 30 on the point from others north-westward and eastward of it. On closing the point, however, the sandy beach and the narrow coastal reef, which dries, eastward of the point will be seen.

A light is exhibited, at an elevation of 49 feet (14^m9), from a white iron framework structure, 49 (14^m9) in height, situated on Tandjoeng Sabra. 35 The navigation along the northern shore is not difficult, but it should not be approached closely anywhere; the banks of the mouths of the rivers are very steep-to. A large casuarina wood near Kampoeng Tarof, situated about 9 miles north-eastward of Tandjoeng Sabra (*Lat. 2° 27' S., Long. 132° 17' E.*), is prominent. There is also a small 40 conspicuous clump of trees in the shallow bight between Tarof and the mouth of Kemoedan rivier, which lies close westward of Tandjoeng Karakra, situated about 14 miles east-south-eastward.

Kemoedan (Kemudan) rivier is fronted by a bar with a depth of half a fathom (0^m9) over it, but there are considerable depths within it, 45 and it is about a cable wide for the first few miles. This river, which is named Aifat in its upper reaches, is navigable by large praus as far as Kampoeng Monggé, situated about 30 miles from its mouth, and by small craft to Samaniak, 12 miles farther up; above this there are rapids. The stream in the lower reaches at normal water level attains 50 a rate of 2 knots.

Wiriager (Wirjagar) rivier, which flows out about 13 miles eastward of Tandjoeng Karakra, is marked by unofficial beacons as far as Kampoeng Wiriager, situated about 2 miles above the mouth.

Sebjar rivier, which flows out about 2½ miles eastward of Wiriager

Charts 3242, 942b, 2759a.

Chart 3743.

rivier, is fronted by a bar with a depth of about one fathom (1^m8) over it, but deepens inside, and has a width of about one cable for the first few miles. A small vessel with local knowledge can proceed about 30 miles up the river. The banks are to a great extent covered at high water. The water is fresh even at the mouth. There are a number of villages on the banks of the river.

Charts 3743, 3742.

Southern shore of Mc Cluer golf.—Dangers.—Anchorages.—A reef, with a least depth of 2 fathoms (3^m7) over it, and not marked 10 by discoloration, extends about 1½ miles westward from Tandjoeng Fatagar. There are strong tide-rips off this point and they extend a considerable distance westward from it. See view facing page 233.

About 2½ miles north-eastward of Tandjoeng Fatagar is Was, an islet, 286 feet (87^m2) high, lying close offshore with foul ground between. 15 A rock, which dries, lies about half a mile offshore, about one mile south-westward of Was.

Chart 3743, plan of Patipi, Salakiti bay and Telok Tawar.

About 2 miles east-north-eastward of Was is Sagemoer, an islet lying on the narrow coastal reef, and which is difficult to identify. 20 A 2½-fathom (4^m6) patch lies close northward of the islet.

Telok Tawar, entered about 2 miles eastward of Sagemoer, affords shelter to small vessels during the South-east monsoon but it is not safe in the North-west monsoon. Kampoeng Roembati (Rumbati) is situated behind a rocky point about 4 cables westward of the western 25 entrance point; the houses stand on piles in the water, and only the mosque is on the land; the village is not visible to a vessel approaching from westward.

Salakiti baai, entered about 1½ miles east-north-eastward of Telok Tawar, is sheltered by several islets and rocks lying north-westward of 30 its north-eastern entrance point, which ensure a smooth anchorage inside. In the south-eastern part of the bay there are some small islets on the shore bank which extends about half a mile off. Kampoeng Patipi, the houses of which stand on posts in a basin which dries, is situated close north-eastward of the north-eastern entrance point of 35 the bay, but it is not visible from seaward.

Patipi baai or Solat Len is entered between Tandjoeng Kramram (Lat. 2° 43' S., Long. 132° 04' E.), about three-quarters of a mile north-eastward of the north-eastern entrance point of Salakiti baai, and Tandjoeng Osir, situated about 1½ miles farther north-eastward. The 40 bay is clear of dangers in the fairway. About three-quarters of a mile from the head of the bay is Boenoha (Bunoha), a small group of rocks above water, lying about 2 cables westward of the edge of a steep-to mudbank, northward of which there is a boat channel leading to the mouth of Degen rivier. There are a few scattered groups of houses 45 along the shores of the bay.

Anchorage may be obtained, in depths of from 4 to 10 fathoms (7^m3 to 18^m3) in Patipi baai. The tidal streams off the entrance to the bay sometimes cause strong eddies.

Chart 3743.

50

The coast between the entrance to Patipi baai and Tandjoeng Sekar, which lies about 20 miles eastward, is rocky, and rises to an elevation of 2,346 feet (715^m0) about 2 miles inland from the tongue of land forming the northern side of Patipi baai.

Charts 3242, 942b, 2759a.

Chart 3743, plan of Sekar bay and approaches.

Baai van Sekar and approaches.—Dangers.—This bay entered between Tandjoeng Sekar and Tandjoeng Taramnoesa, situated about $2\frac{1}{2}$ miles eastward, is afforded protection from the wind and sea by the islands fronting it. Of these, Ogar, 742 feet (226^m2) high, is the largest of a group, which are all steep and thickly covered with vegetation; of the others, the principal are West eiland, 303 feet (92^m3) high, lying $3\frac{1}{2}$ miles west-north-westward of the northern extremity of Ogar, and Argoeni, 437 feet (133^m2) high, situated about $1\frac{1}{2}$ miles eastward of Ogar. The only signs of habitation are on the largest of the Sariga eilanden, between Ogar and West eiland, and at Kampoeng Argoeni, situated on the southern side of the island of that name. See views facing page 244.

Two reefs, with depths of half a fathom (0^m9) and $2\frac{1}{2}$ fathoms (5^m0), lie $2\frac{1}{2}$ miles and one mile, respectively, west-north-westward of West eiland; neither of these reefs is marked by discoloration. Krok, a rock covered with vegetation, lies about a quarter of a mile south-westward of the southern extremity of Ogar. A group of islets, of which Dwars in den Weg is the north-westernmost, lie between the south-eastern side of Ogar and the mainland.

Rede Kokas.—Light.—Anchorage.—The limits of this roadstead are an imaginary line drawn in an 090° direction from the extremity of the point eastward of Kokas, situated on the southern side of the western part of Baai van Sekar, and the arc of an imaginary circle with a radius of 4,101 feet (1250^m0) and the pier head as centre.

A sandbank, with depths of less than 3 fathoms (5^m5) lies in the entrance to Rede Kokas, but the depths over it are liable to change when Kaioeni (Kaiuni) rivier, which flows into the head of the bay, is in spate.

A light (*Lat. $2^\circ 42' S.$, Long. $132^\circ 25' E.$*) is exhibited, at an elevation of 20 feet (6^m1), from a mast on the pier-head at Kokas.

Anchorage may be obtained, in a depth of about $3\frac{1}{2}$ fathoms (6^m9), about a cable northward of the pier-head at Kokas. There is a depth of less than one fathom (1^m8) at the head of the pier.

Kampoeng Kokas, standing on the slope of a hill, is the headquarters of a Government official, whose residence is marked by a flagstaff on the plan. Provisions are scarce. There is a large mosque in Kampoeng Sekar, situated about $1\frac{1}{2}$ miles south-eastward of the pier at Kokas.

Tidal streams.—The tidal stream which sets into the western part of Mc Cluer golf, divides into two branches in the vicinity of West eiland, one setting towards the channel southward of Ogar and Argoeni, the other passing northward of these islands, sets eastward through the channels between the banks in the large bight eastward of these islands. In the narrowest parts the rate is as much as 3 knots. There are strong tide-rips off West eiland.

Directions.—A vessel approaching Baai van Sekar from eastward should pass well eastward of Argoeni to avoid the shoal extending one mile east-south-eastward from it; the summit of this island can be easily identified, and when the summit of Ogar bears 280° she should steer for it on that bearing (*see view facing page 244*), and when $2\frac{1}{2}$ miles from it should steer for Dwars in den Weg, but the southern side of Ogar can be approached closely if necessary; thence pass between Dwars in den Weg and Ogar, and thence into Baai van Sekar by passing close eastward of Tandjoeng Sekar, with the pier at Kokas

Charts 3242, 942b, 2759a.

Chart 3743, plan of Sekar bay and approaches.

bearing 182°, or the residence of the Government official, 185°, which will lead to the anchorage in Rede Kokas.

Small vessels approaching from north-eastward may pass between the western extremity of Argoeni and a small rock, covered with vegetation, which lies at the northern end of a reef with a depth of 2 fathoms (3^m7) over it, situated about 3½ cables west-south-westward, and thence proceed as directed above for a vessel from eastward. Or, a vessel may pass between the largest islet lying midway between Argoeni and Ogar, and the latter island, by steering for the south-eastern point of Ogar, bearing 240°. See view facing page 244. As the tidal stream at its strength is irregular in this vicinity, care should be taken to keep this point in the middle of the opening between the largest islet and those north-westward of it. After passing between these islets the vessel should alter course southward and proceed as directed above.

Chart 3743.

Coast.—Light.—The coast eastward of Baai van Sekar consists of limestone cliffs, thickly covered by vegetation, and rising steeply from the sea. In places there are white chalk patches on the cliffs. In these cliffs there are numerous caves, in which the natives conceal the bones of their dead beneath weapons and household articles, with sacred images to guard them. Blood-red imprints of hands are found on the bare white cliffs in the vicinity of the bones, which are attributed to evil spirits, and sometimes appear at apparently inaccessible spots.

Numerous bare peaks, in the form of cones, give a peculiar character to the mountainous land with trees, devoid of leaves, standing on top like stubble. The mountains, which run parallel to the coast about 2½ miles inland, attain an elevation of 1,530 feet (466^m3), about 5 miles southward of the eastern extremity of Argoeni, but this summit is not conspicuous. Behind this coastal range there is a wide valley, inland of which the central range of the peninsula attains an elevation of 4,754 feet (1449^m0), but also without any distinctive peaks.

Rocky islets, covered with vegetation, lie close off this coast. Goras, close westward of Tandjoeng Goras, which lies about 14 miles south-eastward of Tandjoeng Taramnoesa (*Lat. 2° 41' S., Long. 132° 27' E.*), is the principal village. Batoe (Batu) Lajar, rising from the sea like an obelisk, lies close off Kampoeng Darembang, about 3½ miles north-westward of Goras; it is very prominent from north-westward and bears a resemblance to a prau under sail.

Between Tandjoeng Goras and Tandjoeng Tanah Merah, which lies about 35 miles north-eastward, a wide mudbank extends offshore, and there are many detached shoals, with depths of less than 5 fathoms (9^m1) over them, lying within as much as 12 miles of the coast at the western end, the positions of which may best be seen on the chart.

Near Tandjoeng Goras, the mountains recede inland, leaving a monotonous coast of mangroves. Through this marshy land flow several creeks, the principal of which are Sungei Bedidi and Sungei Bomberai, which discharge 5 and 6 miles, respectively, eastward of Tandjoeng Goras. Each of their entrances is nearly closed by a bar which dries, but they are accessible to small craft with local knowledge. Sungei Bedidi is about 1½ cables wide at its entrance, but narrows to about 45 yards (41^m1) at its junction with Sungei Toewona, a tributary on the western bank, where the fairly large settlement of Sirem stands.

Charts 3242, 942b, 2759a.

Chart 3734.

A light is exhibited, at an elevation of 160 feet (48^m8), close within Tandjoeng Tanah Merah.

GOLF VAN BINTOENI.—The entrance to this gulf lies between 5 Tandjoeng Tanah Merah and Tandjoeng Mingari, which lies 13½ miles north-westward. Both sides are fringed by low marshy land, except for two hills on Tandjoeng Tanah Merah, which are 227 and 257 feet (69^m2 and 78^m3) high, respectively, which are bare on the seaward side and consists of reddish loam.

10 The northern shore has few inhabitants but the southern shore is fairly well populated.

There are some mountains around the head of the gulf which are fairly prominent. The principal of these from north to south are situated as follows:—Steenkoolberg, about 1,640 feet (499^m9) high, 15 about 35 miles east-north-eastward of Tandjoeng Mingari; Sigemerai, with two peaks, 1,710 and 1,759 feet (521^m2 and 536^m2) high, about 7½ miles farther north-eastward; Tawerei, with a round summit, 2,153 feet (656^m3) high, about 23 miles south-eastward of Sigemerai; the two sharp peaks of Tantiri gebergte, 2,078 feet (633^m4) high, 7½ 20 miles southward of Tawerei; and Wiwi, 3,725 feet (1135^m4) high, about 12 miles south-south-eastward of Tantiri gebergte. On the southern side of the head of the gulf are Soewoeri (Suwuri) gebergte, 2,271 feet (692^m2) high, and farther southward are Wagoera and Koté. In the foreground situated 6½ miles west-south-westward of Tantiri 25 gebergte, is the 926 (282^m2) high peak on Poeloe Modan. See view facing page 245.

Tidal streams.—The tidal streams in Golf van Bintoeni turn usually at the times of high and low water. About 5 miles within the entrances of the arms of the sea it may be slack water for about 2 hours 30 about the time of high water. In the lower reaches of these arms, at the strength of the stream there is little difference in the rate of the in-going and out-going streams. The streams at the beginning of the flood and the last of the ebb follow the direction of the channels, but while the banks, which dry, are covered, they set obliquely through the 35 entrances.

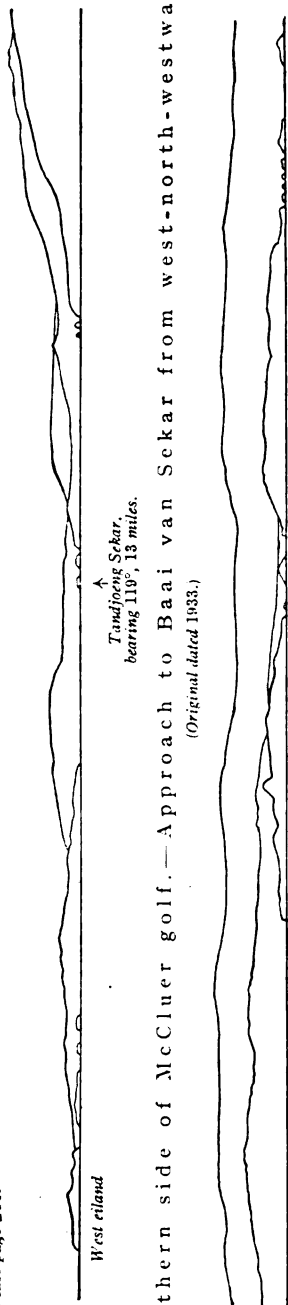
The greater the range, the stronger are the tidal streams. The maximum observed rate in the basin of the gulf was 3 knots; in the arms of the sea the rate is very variable and often considerably more than 3 knots.

40 Close within the mouth of Sungei Moetoeri the tides are semi-diurnal; the in-going and out-going tidal streams, in the directions 070° and 250°, respectively, are equally strong, attaining a maximum rate of 1½ knots at Springs and three-quarters of a knot at Neaps.

Northern shore.—**Buoyage.**—**Beacons.**—**Pilotage.**—The most 45 important rivers on the northern shore are Kamarin, Rittowé and Wasian rivieren, which flow out about 20, 33 and 37 miles respectively, eastward of Tandjoeng Mingari (*Lat. 2° 18' S., Long. 132° 56' E.*). The mouths of the rivers, which are narrow, are difficult to identify; inside, the depths are considerable.

50 Kamarin rivier can be entered by steering for its western entrance point, bearing 008°, which leads in a least depth of three-quarters of a fathom (1^m4); close within the mouth the river divides into two branches and becomes very narrow. To enter Rittowé rivier, local

Charts 3242, 942b, 2759a.



West island

↑
Tandjong Sekar,
bearing 119° , 13 miles.

Southern side of McCluer golf.—Approach to Baai van Sekar from west-north-westward.
(Original dated 1933.)

↑
West island.

Ogar.

↑
Arcoeni,
bearing 217° , $6\frac{1}{2}$ miles.

Southern side of McCluer golf.—Approach to Baai van Sekar from north-north-eastward.
(Original dated 1933.)



Duars in den Weg.

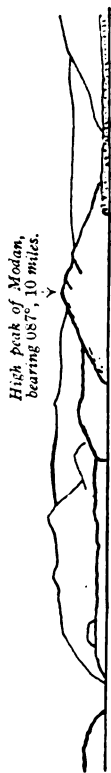
S.E. point
of Ogar.

↑
Summit of Ogar,
bearing 280° , 2 $\frac{1}{2}$ miles.



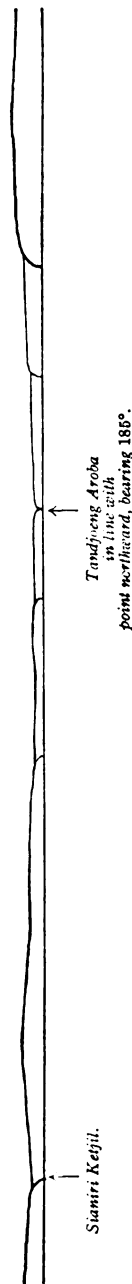
↑
Islet southward of
Duars in den Weg.
S.E. point
of Ogar,
bearing 240° .

Southern side of McCluer golf.—Two views of approach to Baai van Sekar from eastward.
(Original dated 1933.)



Approach to head of Golf van Bintoeni.

(Original dated 1933.)



Sianiri Ketjil.

Southern side of Golf van Bintoeni.—Approach to Sungei Kasoeri from northward.

(Original dated 1933.)



Bearing 176°.

Southern side of Golf van Bintoeni.—Approach to Sungei Kasira from northward.

(Original dated 1933.)



South point of
Amelac Besar,
bearing 110°.

Southern side of Golf van Bintoeni.—Approach to Sungei Kaiteiro from west-north-westward.

(Original dated 1933.)

Chart 3743.

knowledge is necessary; there is a least depth of $3\frac{1}{2}$ fathoms (5^m9) in the channel. Inside the entrance the river curves westward. Wasian rivier has a straight channel, with a least depth of 2 fathoms (3^m7) on the bar, in 1951. To enter, a vessel should steer for the middle of the mouth, bearing 020° ; the depths increase rapidly inside. 5

A spherical light-buoy, painted in red and white horizontal bands and exhibiting a *white flashing* light *every three seconds*, is moored in the estuary of Wasian rivier about 2 miles southward of the mouth of the river. 10

A beacon, surmounted by an appropriate topmark, stands on each bank of Wasian rivier about $1\frac{1}{2}$ miles within the entrance.

Owing to the large rise and fall of the tide at the head of the gulf the appearance of the points vary remarkably with high and low water, and the muddy points are in some cases covered with very low man- 15 groves, rendering them difficult to identify.

A conical light-buoy, painted black, exhibiting a *white flashing* light *every seven seconds* is moored at the western end of the 5-fathom (9^m1) bank extending about $5\frac{1}{2}$ miles west-south-westward from Tandjoeng Kabarisi, situated about 7 miles south-eastward of the entrance to 20 Wasian zeearm. (*Lat. $2^\circ 16' S.$, Long. $133^\circ 39' E.$*).

Sungei Moetoeri (Muturi) is the most important of the sea arms on the northern side of the head of the gulf, as Sungei Komano flows into its northern side, and Kampoeng Moetoeri, the native centre of trade, stands on its banks. The entrance to Sungei Moetoeri is marked 25 by a white conical buoy, surmounted by a ball, moored about $2\frac{1}{2}$ miles north-north-westward of Tandjoeng Kabarisi, and the first reach is marked on the north-western side by a black can buoy surmounted by a truncated cone. A vessel approaching Sungei Moetoeri should pass northward of the light-buoy painted black, moored about $5\frac{1}{2}$ 30 miles west-south-westward of Tandjoeng Kabarisi, and westward of the white conical buoy surmounted by a ball in the entrance to the river.

There is an oil pier situated about 3 miles within the entrance, on the western bank of the river, with a depth of about $5\frac{1}{2}$ fathoms (10^m1) 35 at its head; two dolphins stand northward and southward of the pier-head.

Steenkool-dorp is a settlement situated about 12 miles above the mouth of Wasian rivier; there is a pier here, with a depth of about $2\frac{1}{2}$ fathoms (4^m6) alongside. 40

The limits of the roadsteads of Steenkool, in Wasian zeearm, and of Moetoeri are bounded by the parallel of *Lat. $2^\circ 17' 30'' S.$* between the meridians of *Long. $133^\circ 29'$* and *$133^\circ 46' E.$* and by the coast northward.

The harbour master of Steenkool is the official pilot; pilotage is 45 compulsory, the time of arrival at the outer light-buoy should be reported, by radio, 24 hours beforehand. Vessels awaiting the pilot anchor off Wasian zeearm about one mile southward of the outer light-buoy.

Southern shore.—Inside the entrance of Golf van Bintoeni the 50 character of the southern shore changes, the marshes continue, but they are interspersed by wide salt-water channels; the principal of these from west to east are:—Kasoeri, Kasira and Kaitero, which all extend southward. Eastward of Kaitero, a short, wide, but shallow

Charts 942b, 2759a.

Chart 3743.

arm, penetrates the land, and into which Sungei Wagoera, Sungei Weperar, and Sungei Wemoi flow.

To enter Sungei Kasoeri, a vessel, after rounding the northern point 6 of Asap, an island situated close offshore about 12 miles eastward of Tandjoeng Tanah Merah (*Lat. 2° 26' S., Long. 133° 02' E.*), should steer for the south-western point of Sianiri Ketjil, situated 3 miles eastward of the southern extremity of Asap, bearing 142°; as the mouth of Sungei Kasoeri opens she should alter course southward and keep 10 Tandjoeng Aroba, on the western side of the river, in line with the point on the eastern side, bearing 185° (*see view facing page 245*), which leads between the shoals in the entrance, but care must be taken to avoid the bank which extends eastward from the eastern side of Asap. Inside the river there are no difficulties.

15 There is a shorter route, however, with charted depths of not less than 4 fathoms (7^m3), through Tanoesan Wimaro, between Asap and the mainland, but the channel in its approach is narrow, and the banks on either side steep-to; there are no marks and the stream sets across the channel at either end, so it is unadvisable to attempt it without 20 local knowledge. The southern shore should be held where it enters Sungei Kasoeri.

Sungei Senindara, which flows into Tanoesan Wimaro, has a wide mouth, but it narrows after the first bend. There is a steep-to bank extending from Asap, opposite the eastern entrance point of the 25 Senindara.

To enter Sungei Kasira, a vessel from westward, after rounding the northern point of Asap should steer for the south-western extremity of Amoetoe (Amutu) Besar, bearing 118°, until the western extremity of Sianiri Ketjil is abeam, when she should alter course gradually 30 southward and steer for the second point on the eastern side of Sungei Kasira, bearing 175° (*see view facing page 245*), until the passage between Sianiri Ketjil and Sianiri Besar bears 270°, when she should steer southward into Sungei Kasira. When leaving, the eastern shore should be held.

35 Babo, a large village, at which there are two piers suitable only for boats, is situated on the western side of Sungei Kasira.

Sungei Kaitero.—Sungei Kaitero is the most important river on the southern side of Golf van Bintoeni, its upper reaches being well populated. When near the mouth, the higher land behind the marshes 40 can be seen. Amoetoe (Amutu) Ketjil divides the entrance into two channels. The eastern passage is narrow and shallow, but the western one is wide and deep; outside the entrance the approach is divided by Amoetoe Besar; the eastern branch, named Taridoera, runs between Amoetoe Besar and Amoetoe Ketjil, and the western branch 45 between the southern side of Amoetoe Besar and the mainland.

Approaching Sungei Kaitero by the western passage, when north-eastward of Sianiri Ketjil, a vessel should steer for the southern extremity of Amoetoe Besar, bearing 110° (*see view facing page 245*), which will lead between the shoals in the eastern part of the channel; 50 after passing close along this southern point, she should steer for Amoetoe Ketjil (*Lat. 2° 31' S., Long. 133° 38' E.*) and subsequently south-south-eastward into Sungei Kaitero. The first bluff on the western side of the river should be passed close to, on account of the drying banks which lie in mid-channel.

Charts 942b, 2759a.

Chart 3743.

On leaving Sungei Kaitero and proceeding by the western passage, southward of Amoetoe Besar, after having rounded the southern point of that island, if it is clear, a vessel should steer for the northern point of Asap, bearing 293° , otherwise keep the southern point of Amoetoe Besar bearing 110° astern, until north-eastward of Sianiri Ketjil. 5

A vessel using the eastern passage, Taridoera, should steer for the north-eastern extremity of Amoetoe Ketjil, bearing 126° , altering course to 170° when the eastern extremity of Amoetoe Besar bears 180° ; this latter course leads through the deepest part of the passage and close 10 along the eastern coast of Amoetoe Besar. The western side of the channel is steep-to, but the eastern side shoals gradually. When abreast the western extremity of Amoetoe Ketjil the south-western coast of this island should be followed, afterwards proceeding as previously directed. 15

Head of Golf van Bintoeni.—Anchorage.—Poeloe Modan is rocky at its western extremity. A mudbank, which dries, extends about $7\frac{1}{2}$ miles westward from the western extremity of Noesawammer (Nusawammer), an island, which lies about half a mile northward of Poeloe Modan. On this mudbank there are two clumps of mangroves, 20 the western of which, named Karaka, lies about $2\frac{3}{4}$ miles from the western extremity of Noesawammer.

Straat Noesawammer is the passage between the island of the same name and Poeloe Maniai, situated about half a mile northward. Its entrance, which lies between the mudbank which extends westward 25 from Noesawammer, and a low island lying about $1\frac{1}{2}$ miles northward, is fronted by a bar, with a depth of about $1\frac{3}{4}$ fathoms (3^m2) over it. Srewenoe, a rocky and moderately high islet, lies near the middle of the strait, about 5 miles eastward of Karaka. A vessel entering should keep the first point on the southern side of Maniai eastward of Srewenoe, 30 midway between that islet and the southern side of Maniai; if, however, this mark is not plainly visible, she should keep on the northern side of the channel when passing Karaka.

Straat Modan, between Poeloe Modan and two islands which lie southward of it, is deep, but is fronted by a bar at its western end, 35 with depths of less than 3 fathoms (5^m5) over it. A least depth of $2\frac{1}{2}$ fathoms (4^m6) can be carried, with the peak on Poeloe Modan bearing 095° ; southward of this line of bearing the depths decrease gradually, but northward of it they decrease rapidly towards the ridge, over which there is a least depth of a quarter of a fathom (0^m5), which extends 40 westward from Poeloe Modan.

Anchorage may be obtained, in a depth of about 11 fathoms (20^m1), in Straat Modan.

Sungei Jakati, which is narrow, flows into Straat Modan on the eastern side of Poeloe Modan. On the southern side of the strait, is 45 Sungei Soearawara (Suarawara), into which a number of creeks flow.

Chart 3742.

WESTERN SIDE OF NEW GUINEA.—Coast.—(Continued).—The general aspect of the coast between Tandjoeng Fatagar (*Lat. $2^{\circ} 46' S.$, Long. $131^{\circ} 55' E.$*) and Kaap van den Bosch, which lies about 50 100 miles south-eastward, is densely wooded, mountainous land, usually terminating in steep, rocky cliffs. The eastern side of Sebakor baai (page 250) is, however, considerably lower, with an upward

Charts 3242, 942b, 2759a.

Chart 3742.

gradient, forming a division between the mountainous Koemawa territory and that lying northward of Sebakor baai. The southern portion is practically uninhabited; farther northward, there are a few villages, the inhabitants of which become more civilized as Fak Fak is approached.

The whole of this mountainous land is very uniform, so that there are few noticeable features from a distance, except the rocky islands off and westward of Fak Fak and the islands off Weri baai (page 250) and Sebakor baai. Goenoeng Baik, 3,448 feet (1050^m9) high, with a rounded summit, which stands on the southern side of the entrance to Sebakor baai, and a conical peak, 3,297 feet (1004^m9) high, which stands about 4½ miles northward of Kaap van den Bosch, may, however, be identified.

*15 Chart 3743.***Off-lying islands and dangers. — Light. — Anchorages. —**

Pisang eilanden, lying about 19 miles west-north-westward of Tandjoeng Fatagar, consist of Saboeda, four islets close together southward of it, and Tartaroega and Sentjan, two rocky islets, 194 and 152 feet (59^m1 and 46^m3) high, lying about 2½ and 5½ miles, respectively, west-north-westward of the northern extremity of Saboeda. All are covered with vegetation and rise steeply from the sea.

Saboeda, which is 536 feet (163^m4) high, is fringed by a narrow reef. Tartaroega and Sentjan are also fringed by reefs, and in their vicinity are a number of shoals, with depths of from 2 to 3½ fathoms (3^m7 to 6^m9) over them, the positions of which may best be seen on the chart. See view facing page 252. There is a clear channel between Saboeda and the group of islets southward of it.

A light is exhibited, at an elevation of 260 feet (79^m3), from a white tower, 49 feet (14^m9) in height, on the north-eastern end of Saboeda.

A 2½-fathom (5^m0) patch lies 2½ miles north-westward of Sentjan.

Anchorage may be obtained during the South-east monsoon between the northern side of Saboeda and Tartaroega, but caution must be observed on account of the shoals in this vicinity. A sheltered anchorage during both monsoons may be obtained southward of Saboeda; during the South-east monsoon, however, it is preferable to anchor off the northern side of Saboeda. (Lat. 2° 38' S., Long. 131° 37' E.).

Chart 3742.

Coast.—Anchorages.—The coast between Tandjoeng Fatagar and Tandjoeng Kokraaf, situated about 9½ miles southward, is divided into two bays by a tongue of land terminating in Tandjoeng Tegin. These points are all high, and inland of them the country is mountainous and thickly covered with vegetation (*see above*).

Batoe Poetih (Batu Putih), 505 feet (153^m9), rocky, and covered with vegetation, lies about three-quarters of a mile southward of Tandjoeng Kokraaf; its western extremity is a conspicuous headland with white rocky cliffs. See view facing page 252. A coral patch, with a depth of 16 feet (4^m9) over it, lies about a quarter of a mile northward of the middle of the northern coast of the island. A 39-foot (11^m9) shoal was reported, in 1949, to lie about half a mile west-north-westward of the 16-foot (4^m9) patch.

Between Tandjoeng Kokraaf and Tandjoeng Riboettoetin, which lies about 7 miles south-eastward, there are two bays, Telok Togarwatan and Telok Sipatnamam separated by Tandjoeng Gangroerimoer, and

Charts 3242, 942b, 2759a.

Chart 3742.

which afford anchorage. A detached reef, with a depth of 21 feet (6^m4) over it, lies off the head of Telok Sipatnanam; it is parallel with the coast, from which it is separated by a deep and narrow channel.

Chart 3742, plan of Channels near Pandjang.

5

Between Tandjoeng Riboettoetin (*Lat.* 2° 58' S., *Long.* 132° 04' E.) and Fak Fak, which lies 13½ miles eastward, the principal villages are Atti Atti Onin and Werpigang, situated 5 and 6 miles, respectively, east-north-eastward of Tandjoeng Riboettoetin; the houses stand on piles in shallow water or on patches, which dry, and are connected to the 10 coast by bamboo bridges, more than 100 yards (91^m4) long in places.

Off-lying islands.—Light.—Ekka, situated with its western extremity about 1½ miles south-eastward of Tandjoeng Riboettoetin, is a rocky and wooded island, bordered by a white beach. A reef, with a depth of 10 feet (3^m0) at its outer end, extends about half a mile east-south-eastward from the eastern extremity of the island. On the western side, northward of Ekka the channel comes to a dead end, in an area of islets and reefs, which is not navigable.

Pandjang, an island, the western end of which lies about 1½ miles eastward of Ekka, with a deep channel in the fairway between, has 20 a narrow ridge of hills extending along its entire length. A reef extends about a quarter of a mile from Tandjoeng Wamaroesa, the eastern point of the island. There is a deep and clear passage between this point and the mainland. The island is inhabited, principally by Chinese. See view facing page 252.

25

A light is exhibited, at an elevation of 108 feet (32^m9), from a white iron framework structure, 42 feet (12^m8) in height, situated on Tandjoeng Wamaroesa.

Chart 3742 with plan of Channels near Pandjang.

Rede Fak Fak and approaches.—Dangers.—Light.—Beacon.— 30 Egeron reef, with a depth of 5 feet (1^m5) over it, lies about 5½ miles southward of Tandjoeng Wamaroesa. A shoal, with a depth of 11 feet (3^m4) over it, lies nearly a mile farther southward, and a shoal, with a depth of 8 feet (2^m4) over it, lies about 1½ miles westward of the reef. Between these dangers and Tandjoeng Wamaroesa there are a number 35 of shoals with depths of from 6 to 11 feet (1^m8 to 3^m4) over them, the positions of which may best be seen on the chart. Two reefs, with depths of 6 and 8 feet (1^m8 and 2^m4) over them, lie about 6½ miles south-eastward and 3½ miles east-south-eastward, respectively, of Tandjoeng Wamaroesa; these reefs are marked by discoloration under favourable 40 conditions.

Toebi (Tubi) Sérang is a rocky wooded islet lying near the outer end of a reef which dries, extending about 8 cables south-south-westward from a point on the mainland situated about 2½ miles northward of Tandjoeng Wamaroesa. Near the inner end of this reef is Kéké, 45 a rock above water.

Meti Meti rif, which dries and is steep-to, lies about one mile south-westward of the light structure at Fak Fak; it is marked on its south-eastern side by an unofficial white beacon surmounted by a white ball.

The limits of the roadstead are the meridians through Meti Meti rif 50 and Toebi Sérang and the parallel through the latter.

A light is exhibited at the head of the pier.

Anchorage.—Directions.—Anchorage may be obtained, in a depth of 25 fathoms (45^m7), southward of Fak Fak. A vessel should approach

Charts 3242, 942b, 2759a.

Chart 3742 with plan of Channels near Pandjang.

the anchorage on a northerly course, and anchor when the steep point situated about 3 miles south-eastward of the light-structure is seen midway between the northern extremity of Toebi Sérang (*Lat.* $2^{\circ} 57' S.$, *Long.* $132^{\circ} 18' E.$) and the southern extremity of Kéké, or on opening the channel between Ekka and Pandjang; the vessel will then lie about one cable from the steep-to coastal reef.

Fak Fak.—Beacons.—This village stands on a hill, about 330 feet (100^m6) high, on the western side of the entrance of an inlet, into the head of which Sungei Fak Fak flows; this river usually dries for a distance of half a mile from its mouth. Each side of the entrance to the inlet is marked by a beacon.

Fak Fak is the headquarters of a Government official. Provisions are scarce. There is a hospital in the town.

The country in the vicinity of Fak Fak, unlike that elsewhere on this coast, is fairly well populated.

Chart 3742.

Coast.—Oerat (Urat), an island separated from the mainland by Pinto Ketjil, a very narrow shallow passage, lies about 19 miles south-eastward of Fak Fak. Semai, an island, 1,578 feet (481^m0) high, is separated from Oerat by Pinto Besar, with a least width of about half a cable between the drying reefs on either side, and depths of over 11 fathoms (20^m1) in the fairway. Kawar Noewa (Nuwa), an islet about $1\frac{1}{4}$ miles southward of the south-eastern extremity of Semai, is prominent.

Weri baai, entered between Oerat and Tandjoeng Kirana, situated about 4 miles southward, affords good anchorage during the South-east monsoon, in depths of from 22 to 27 fathoms (40^m2 to 49^m4). Kampoeng Toenas Gain stands on the northern side of the bay.

Off-lying dangers.—A shoal with a depth of 52 feet (15^m8) over it, lies about $2\frac{1}{4}$ miles east-north-eastward of Tandjoeng Toebokmatan, the north-western point of Semai. A reef, which dries, lies about 6 miles west-north-westward of Tandjoeng Kirana, and several reefs, with depths of from 11 to 18 feet (3^m4 to 5^m5), lie in the southern approach to Weri baai, within $2\frac{1}{2}$ miles of the coast, the positions of which may best be seen on the chart.

Sebakor baai.—Dangers.—Anchorage.—Sebakor baai or Rijklof van Goens baai, entered between Tandjoeng Toerkanggoer (Turkang-gur), situated about 6 miles south-south-eastward of Tandjoeng Kirana, and Tandjoeng Tongerai, which lies about 20 miles farther southward, affords anchorage during both monsoons anywhere under the lee of the points and islands.

Karas, an island, 1,605 feet (489^m2) high in its northern part, Toeboeroeasa (Tuburuasa), and Faoer (Faur), the latter 1,076 feet (328^m0) high at its southern end, divide the bay into two parts, the north-western of which is clear of dangers, as are also the channels between the islands; the eastern part, however, is encumbered with a number of shoals, which are all marked by discoloration under favourable conditions, extending as much as $2\frac{3}{4}$ miles offshore in the northern part and 5 miles in the southern part, the positions of which may best be seen on the chart; but it is not certain whether all the reefs have been found.

A small drying reef lies off the eastern side of Toeboeroeasa, about half a mile northward of its eastern extremity.

Charts 3242, 942b, 2759a.

Chart 3742.

A 3-fathom (5^m5) patch lies about 4 miles west-north-westward of the north-western extremity of Karas.

A shoal with a depth of 59 feet (18^m0) over it, the position of which is approximate, was reported, in 1954, to lie about 4 miles west-south-westward of the same point. 5

Anchorage may be obtained, in depths of from 27 to 38 fathoms (49^m4 to 69^m5) off Kampoeng Mas, situated on the south-eastern side of Karas.

There are several villages on the islands, but the mainland is uninhabited. 10

Coast.—Anchorage.—Goenoeng Baik, which stands about 4 miles south-south-eastward of Tandjoeng Tongerai, has been described on page 248.

Between Tandjoeng Tongerai (*Lat. $3^{\circ} 38' S.$, Long. $132^{\circ} 42' E.$*) and 15 Kaap van den Bosch, situated about 29 miles southward, the coast is mostly inaccessible, and is uninhabited.

Anchorage may be obtained, in a depth of about 27 fathoms (49^m4), either northward or southward, according to the monsoon, of the islet which lies on the coastal reef about $11\frac{1}{2}$ miles southward of Tandjoeng 20 Tongerai. A shoal, with a depth of 39 feet (11^m9) over it, lies about half a mile offshore about $1\frac{1}{2}$ miles southward of this islet. A sunken reef, with a depth of 23 feet (7^m0) over its northern end, was reported, in 1950, to lie about 5 miles south-westward of the islet.

Chart 3742, plan of Sanggala and Wap baaien.

25

Sanggala baai and approaches.—Dangers.—Anchorages.—This bay is entered between the northern extremity of Mommon, a peninsula extending north-north-westward from a position about 20 miles southward of Tandjoeng Tongerai, and a point about $1\frac{1}{2}$ miles north-eastward. It can be easily identified by a distinctive waterfall 30 which shows as a white patch, on the mainland, about $1\frac{1}{2}$ miles northward of the entrance.

Two islets lie on a reef about one mile north-westward of the waterfall and about half a mile offshore, and a 26-foot (7^m9) patch lies about 6 cables westward of the waterfall. Several islets lie close off the 35 northern extremity of Mommon (*Lat. $3^{\circ} 55' S.$, Long. $132^{\circ} 48' E.$*), and a spit, with a depth of 15 feet (4^m6) near its outer end, extends about 4 cables northward from the largest islet. A shoal, with a least depth of one foot (0^m3) over it, and two patches which dry, southward 40 of it, lie within the bay.

Anchorage may be obtained, in depths of from 16 to 22 fathoms (29^m3 to 40^m2), during the South-east monsoon, between the 26-foot (7^m9) patch and the waterfall; also northward of the patch which dries, in the middle of the bay, in depths of from 16 to 27 fathoms (29^m3 to 49^m4), or southward of it, in a depth of about 18 fathoms 45 (32^m9), sand.

Wap baai.—Anchorage.—This bay, lying on the southern side of the isthmus connecting Mommon to the mainland, is fronted by three islets lying close together on a bank, eastward of which a vessel may obtain anchorage, in a depth of 28 fathoms (51^m2). During the 50 South-east monsoon the swell runs into the head of the bay.

Chart 3742.

Coast.—Anchorage.—Between Wap baai and Kaap van den Bosch the coast is steep-to, but during the South-east monsoon

Charts 3242, 942b, 2759a.

Chart 3742.

anchorage may be obtained in a less steep part in a bight about 2 miles northward of Kaap van den Bosch; on the northern side of this bight there is a prominent rock, covered with vegetation. A rivulet, which dries at its mouth, flows out close to a similar rock on the southern side of the bight.

Charts 3742, 2102.

The mountain, which stands about $4\frac{1}{2}$ miles northward of Kaap van den Bosch, has been described on page 248.

*10 Chart 2102.***SOUTH-WESTERN SIDE OF NEW GUINEA.—Coast.—**

Between Kaap van den Bosch and Tandjoeng Bohia, which lies about 100 miles eastward, the coast forms a large bay, the north-western shore of which is flat and fringed by shoals; between Tandjoeng Oesau (see below) and Tandjoeng Simora (page 256) it is low and marshy; the north-eastern shore is high and steep, with considerable depths off it.

Tidal streams.—The tidal stream sets west-north-westward along the north-eastern shore with the rising tide. The streams in the outer part of this large bay are weak, and increase in strength in the narrow channels and entrances to the smaller bays.

Coast.—Anchorages.—The coast between Kaap van den Bosch (Lat. $4^{\circ} 05' S.$, Long. $132^{\circ} 54' E.$) and Tandjoeng Oesau (Usau), situated about 21 miles eastward, is high, densely wooded, and steep. Noesa Woelan (Nusa Wulan) or Rulofs eiland lies close offshore between Kaap van den Bosch and Tandjoeng Papisoi, situated about 7 miles east-south-eastward. About $2\frac{1}{4}$ miles north-eastward of Tandjoeng Papisoi the two Derdi eilandjes lie, with a $1\frac{1}{2}$ -fathom (3^m2) patch about half a mile westward; a 5-fathom (9^m1) patch lies one mile southward of the southern islet.

Anchorage may be obtained during the West monsoon close offshore westward of Derdi eilandjes, or in the bight north-eastward of the islet lying close offshore about $2\frac{1}{4}$ miles north-north-eastward of Tandjoeng Papisoi. During the East monsoon anchorage may be obtained, in a depth of about $7\frac{1}{2}$ fathoms (13^m7), on the ridge between Noesa Woelan and the mainland.

Straat Nautilus and approaches.—Dangers.—This strait, separating Adi from the mainland in the vicinity of Tandjoeng Oesau, has a least depth of 7 fathoms (12^m8) in the fairway, which is about one mile wide between Oerobi (Urobi), a rocky islet covered with high vegetation, situated 6 miles eastward of Tandjoeng Oesau, and the reef which lies about one mile off the northern end of Adi. A 5-fathom (9^m1) patch lies about 4 cables southward of Oerobi.

Adi is a low island, with low hilly land without any outstanding summits in the western part. See view facing this page. Toemboe (Tumbu Tumbu) or Vogel eilandje, which is covered with vegetation and fringed by a reef, which dries, lies about 8 miles westward of the southern extremity of Adi. Within 3 miles northward of the islet are several shoals with depths of from $3\frac{1}{4}$ to 6 fathoms (5^m9 to 11^m0) over them, and a $4\frac{3}{4}$ -fathom (8^m7) patch lies about $2\frac{3}{4}$ miles south-eastward of the islet. A $4\frac{1}{4}$ -fathom (7^m8) patch lies about 2 miles west-south-westward of the southern extremity of Adi.

A reef, which dries, lies about $1\frac{1}{4}$ miles eastward of Tandjoeng Loematta (Lumatta), the north-eastern extremity of Adi, with a

Charts 3243, 942b, 2759a.



Saboeda.

Pisang eilanden—North-eastern extremity of Saboeda, bearing 300°, 3 miles.
(Original dated 1933.)



Tandjoeng Falagar,
bearing 336°, 19 miles.

Batoe Poetih.

*Conspicuous
white
headland.*

*Tandjoeng
Gangroetmoer.*

West coast of New Guinea.—Approach to McCluer gulf from southward.
(Original dated 1933.)



Ekka.

↑
*Bearing
359°.*

Pandjang.

West coast of New Guinea.—Approach to Fak Fak from westward.
(Original dated 1933.)



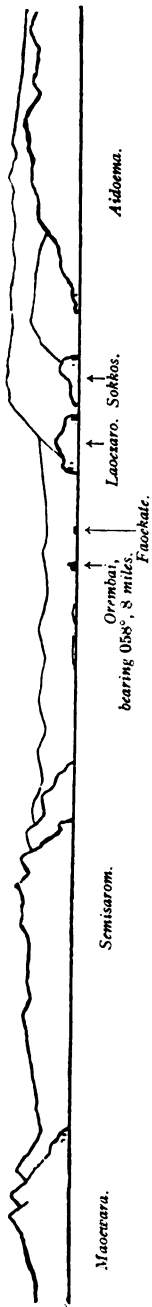
Toemboe Toemboe,
bearing 304°.

Adi.

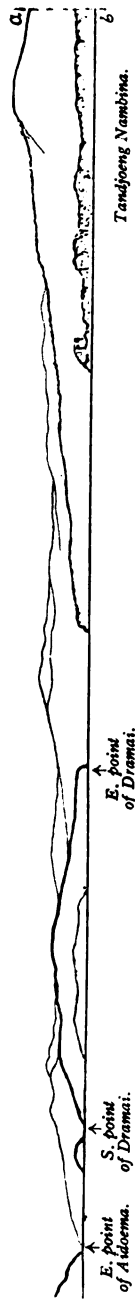
South-west coast of New Guinea.—Approach to Straat Nautilus from south-eastward.
(Original dated 1933.)



South-west coast of New Guinea.—Approach to Bitsjara baai from south-westward.
(Original dated 1933.)



South-west coast of New Guinea.—Approach to Triton baai from south-westward.
(Original dated 1933.)



Summit of Kajoe Merah,
bearing 061°, 7 miles.



South-west coast of New Guinea.—View, in two parts, of approach to Kajoe Merah baai from west-south-westward.
(Original dated 1933.)

Chart 2102.

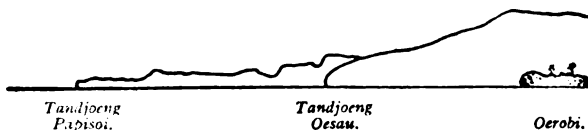
passage between in which there is a depth of about $1\frac{1}{2}$ fathoms (2^m7). A $1\frac{1}{2}$ -fathom (2^m3) patch and a reef, which dries, lie about $4\frac{1}{2}$ and $6\frac{3}{4}$ miles, respectively, eastward of Tandjoeng Loematta, and a $4\frac{3}{4}$ -fathom (8^m7) patch lies about 4 miles east-south-eastward of the same point and nearly 2 miles offshore. A reef, with a depth of one fathom (1^m8) over it, lies about 14 miles east-south-eastward of Tandjoeng Loematta.

A rocky islet lies one mile westward of Oerobi; there are several shoals, with depths of from $3\frac{1}{4}$ to $4\frac{1}{2}$ fathoms (5^m9 to 7^m8) over them, 10 within 3 miles westward and north-north-eastward of the islet; Oenoga (Unoga) and Noes (Nus) Tiga are rocky islets lying about $1\frac{1}{2}$ miles north-north-westward and $3\frac{3}{4}$ miles north-north-eastward, respectively, of Oerobi. Simla rif, with depths of less than 3 fathoms (5^m5) over it, lies between Oenoga and the mainland, and a drying 15 reef lies about half a mile south-eastward of the islet. A $2\frac{1}{2}$ -fathom (4^m6) patch lies about 3 miles east-north-eastward of Oerobi. Karawatoe and Keliwala are low islets covered with high vegetation, each fringed by a reef, which dries; they lie on the outer edge of a bank with depths of less than 10 fathoms (18^m3) over it, which extends about 20 10 miles offshore, about $6\frac{1}{2}$ and $10\frac{1}{2}$ miles, respectively, east-north-eastward of Oerobi. There are several shoal patches between Keliwala and the mainland, and northward and westward of Karawatoe, the positions of which may best be seen on the chart.

A $4\frac{3}{4}$ -fathom (8^m7) patch lies about 6 cables south-south-eastward 25 of Karawatoe. A $2\frac{3}{4}$ -fathom (5^m0) patch, a $3\frac{1}{4}$ -fathom (5^m9) patch and a rock, with a depth of less than one fathom (1^m8) over it, lie, respectively, about $3\frac{1}{4}$, $4\frac{1}{2}$ and $6\frac{1}{2}$ miles north-eastward of Keliwala; a shoal with a depth of $2\frac{3}{4}$ fathoms (5^m0) over it, lies about $2\frac{1}{2}$ miles northward and a $3\frac{1}{2}$ -fathom (6^m4) patch, about 3 miles north-north- 30 eastward of the same islet; a $4\frac{1}{2}$ -fathom (8^m2) patch lies about midway between the latter two shoals.

Tidal streams.—In Straat Nautilus and southward of Adi, the tidal steams set eastward with the rising tide, and west-north-westward with the falling tide. At times, the sea breaks over the entire width 35 of the strait, owing to the tidal streams meeting from three different directions.

Directions.—A vessel approaching Straat Nautilus from westward should keep the south-eastern extremity of Oerobi in line with the north-western extremity of Karawatoe, bearing 067° , until Tandjoeng 40 Oesau (*Lat. $4^\circ 04' S.$, Long. $133^\circ 14' E.$*) is abaft the beam and bearing 271° , the vessel should bring this point astern on this bearing and thus



Tandjoeng Oesau, bearing 268° .

(Original dated 1933.)

pass between Oerobi and the dangers northward of Adi. Care must be taken not to deviate from this line as the tidal stream sets across the channel in this vicinity.

45

Charts 942b, 2759a.

Chart 2102.

Karoefa rivier.—This river, which drains the wide marshy district between Sebakor baai and Kamrau baai (*see below*), flows out 14 miles north-eastward of Tandjoeng Oesau. During 1911, the in-going and 5 out-going tidal steams were observed to flow regularly, even during neaps.

Vessels not exceeding 164 feet (50^m0) in length can navigate Karoefa (Karufa) rivier for 16 miles from its mouth; beyond this point, although there is sufficient depth, the channel becomes narrow. A wide bar, 10 over which there was a depth of about 1½ fathoms (2^m7) in 1911, fronts the river mouth. A depth of about 2½ fathoms (4^m6) can be reckoned on at mean sea level.

To cross the bar a vessel should steer for the southern entrance point at Kampoeng Tagiri, bearing about 305°, or with the north-eastern 15 extremity of Keliwala astern, bearing 125°, until a depth of more than 2½ fathoms (5^m0) is obtained, when she should alter course northward; there are some stakes, situated on the edge of the reef which dries, off Kampoeng Tagiri, which may be passed fairly close-to. Care must here be taken to avoid a small dangerous rock which dries, lying on 20 the northern side of the channel.

The water is very muddy, and there is no discoloration. There are two detached reefs in the river, but they can be avoided by holding close along the left bank. For the greater part, the banks are covered with mangroves. Many small creeks flow into the river. Above 25 Kampoeng Kanaka, situated close within the entrance, there are no signs of habitation.

Anchorage.—Anchorage may be obtained during the North-west monsoon, in depths of from 3½ to 4½ fathoms (6^m9 to 7^m8), anywhere on the extensive mud flat which extends more than 5 miles from the low, 30 marshy coast between the entrance to Karoefa rivier and Kamrau baai.

Kamrau baai and approaches. — **Dangers.** — This bay is entered between Tandjoeng Taronmeta (*Lat. 3° 34' S., Long. 133° 34' E.*), a low point, situated about 22 miles north-north-eastward of the entrance to Karoefa rivier, and Tandjoeng Simora, a low point, 35 situated about 9 miles south-eastward of Tandjoeng Taronmeta.

A 2½-fathom (5^m0) patch lies about 13 miles southward of Tandjoeng Simora; two rocks, with depths of 2½ and 2½ fathoms (4^m6 and 5^m0) over them, lie about 9½ and 10½ miles south-south-westward and a 6½-fathom (11^m4) patch about 10½ miles southward of the same point; 40 a 4½-fathom (8^m7) patch and a 5-fathom (9^m1) patch lie about 3½ and 2 miles southward of Tandjoeng Simora; foul ground, with depths of from 3 to 4 fathoms (5^m5 to 7^m3) on its outer edge, extends about 1½ miles southward and south-westward of that point. Depths of less than 3 fathoms (5^m5) extend about half a mile westward and south- 45 westward from the northern end of Tandjoeng Simora.

On the western side of the entrance, on an extensive bank, which dries, are Madais Besar and Madais Ketjil, low islets covered with high vegetation, with another rock, covered with vegetation, between them. Noes Toemba (Nus Tumba), a rock above water, lies on the drying reef 50 which extends about 1½ miles southward from Tandjoeng Taronmeta. Poeloe Serotte, a low islet, covered with high vegetation, lies at the northern end of a ridge which divides the entrance into two channels, about 3½ miles eastward of Tandjoeng Taronmeta (*Lat. 3° 34' S., Long. 133° 34' E.*).

Charts 942b, 2759a.

Chart 2102.

This ridge extends about $6\frac{1}{2}$ miles southward from Poelee Serotte, and the shoals at its southern end, with depths of from 2 to $3\frac{1}{2}$ fathoms (3^m7 to 6^m4) over them, lie in the entrance to the eastern channel.

The western channel should not be used as it is encumbered with reefs and shoals. 5

From a position about 2 miles northward of Tandjoeng Simora, for a distance of about 10 miles, the eastern side of the channel is fronted by reefs and foul ground to a distance of about $1\frac{1}{2}$ miles offshore.

Above Poeloe Serotte the ridge mentioned above is continued 10 north-north-westward, for a distance of about $4\frac{1}{2}$ miles, as a series of shoals and patches with depths of from 3 to 5 fathoms (5^m5 to 9^m1) over them, leaving only a narrow channel between them and the shore bank on either side of the channel.

A three-quarter fathom (1^m4) patch lies off the entrance to Argoeni 15 baai and about 6 miles northward of Poeloe Serotte.

Ombwallar rivier and Irimawa rivier, which flows into the north-western part of Kamrau baai, are more in the nature of arms of the sea and drain the extensive marshy land. Ombwallar rivier, as far as it has been surveyed, and its approach from Kamrau baai are easily 20 navigated, but Irimawa rivier is difficult as the edges of the banks on either side are steep-to, and the water is muddy, so that the sunken dangers cannot be seen.

Argoeni baai.—Dangers.—This bay, which is entered at the head of Kamrau baai, close southward of Sjiirnoesoe (*Lat.* $3^{\circ} 26' S.$, *Long.* $133^{\circ} 36' E.$), extends about 40 miles northward.

The greater part of the shore in the southern portion is steep-to, although high only in a few places; the western side of the northern portion is everywhere low; the eastern side is moderately steep, rocky, and densely covered with vegetation. There are several mountains 30 on the eastern side of the bay, Genofo, 4,076 feet ($1,242^m4$) high, with a conical peak, being the southernmost. Argoeni baai is much more thickly populated than other parts of the coast in the vicinity, and the villages, larger and more prosperous; in the northern part they are nearly all built out into the sea on piles over the shore reef and 35 connected to the shore by bridges of tree trunks.

Argoeni baai is difficult to navigate, particularly the southern portion, unless it has been previously buoyed; the heavy swirls make it difficult to keep a vessel on her course, and the muddy water makes it impossible to detect any dangers. The junction of Kamrau baai and 40 Argoeni baai is about half a mile wide, and is obstructed south-eastward of Sjiirnoesoe in the entrance by four dangerous reefs, three of which are only a few yards in diameter and very steep-to; three of them dry and one has a depth of one foot (0^m3) over it. It was reported, in 1951, that the reef situated about $4\frac{1}{2}$ cables south-eastward of the 45 southern extremity of Sjiirnoesoe had extended eastward and south-westward.

According to information from the natives, a day's journey up the river at the head of Argoeni baai leads to the upper reaches of two streams, along one of which a prau can reach Mc Cluer golf, and along 50 the other, Geelvink baai. (*See Pacific Islands Pilot, Vol. I.*)

Directions.—Argoeni baai may be identified by Genofo (*Lat.* $3^{\circ} 17' S.$, *Long.* $133^{\circ} 41' E.$), which is visible from all directions, and the entrance may be clearly seen. A vessel should not attempt to

Charts 942b, 2759a.

Chart 2102.

enter at the full strength of the tidal stream; the best time is about one hour after low water, when the three westernmost reefs in the entrance are still visible, and the out-going stream is less felt. Slack
5 water, which only lasts for a few minutes, occurs from 1½ to 2 hours after high and low water.

A vessel should enter with the north-western extremity of Loem, an islet situated close off the southern shore about 2½ miles eastward of Sjimoesoe, in line with an islet, bearing 062°, about one mile east-
10 north-eastward of the southern extremity of the same island, and continue on this line until the western side of the point close westward of Kampoeng Namasan, situated 1½ miles southward of Sjimoesoe, is in line with the western extremity of the island northward of the village, bearing 190°, which will lead in a least depth of 4½ fathoms
15 (7^m8).

Thence the western shore should be kept at a distance of not less than 1½ cables; the eastern side is less steep-to and can be picked up by sounding. When near the islet close to the western shore, abreast the grey patch, situated about 3½ miles northward of Loem, she should
20 cross over to the eastern shore, which can be closely approached northward of the patch. At low water the rocks, which dry, on the southern end of the reef near the western shore can be easily seen. The vessel should not attempt to pass through the narrow part between the two Ajar Poetar (Ayar Putar) villages, situated on the eastern
25 side, about 2½ and 4 miles, respectively, northward of the grey patch, at the strength of the tidal stream, on account of the tide-rips and swirls; she should close the eastern shore here, to avoid the drying rock on the western side.

In the straight stretch between Kampoeng Berdaha, situated
30 about three-quarters of a mile northward of the northern Kampoeng Ajar Poetar and Kampoeng Nagoera, which stands on the western shore about 5 miles northward, there are no dangers except a pinnacle rock situated nearly half a cable off the western shore, about half a mile north-westward of Kampoeng Berdaha, a rock, which dries,
35 close off the eastern shore about 2½ miles northward of Berdaha, and a reef, with a least depth of 3½ fathoms (5^m9) over it, extending south-south-westward from the same shore, about three-quarters of a mile farther northward.

After passing this reef the vessel should steer to pass midway
40 between the eastern shore and three islets off Tandjoeng Nagoera, thence bring this point in line astern with the eastern side of the southernmost of the three islets, bearing 205°, which leads westward of two rocks, which dry, lying about one mile north-north-eastward of the point. After passing Tandjoeng Nagoera the tidal stream suddenly
45 slackens. Thence the vessel must be guided by the chart. A rocky reef, which dries, extends from the southern extremity of Soesoenoë (Susunu), an island which lies close off the western shore, 11 miles north-north-eastward of Tandjoeng Nagoera, and a similar reef extends off the northern extremity of Faternoes, an island on the
50 eastern side of the channel situated about 1½ miles south-eastward of Soesoenoë. The out-going stream sets on to both of these reefs.

Kalmana baai.—This bay is entered between Tandjoeng Simora and Tandjoeng Bitsjara (*Lat.* 3° 44' S., *Long.* 133° 48' E.), the steep termination of a high tongue of land extending south-south-eastward,

Charts 942b, 2759a.

Chart 2102.

which lies about 8 miles south-eastward. Tandjoeng Simora and the western side of the bay are fringed by a wide reef, which dries, extending about 8 cables offshore near the mouth of Sungei Air Tiba, situated about $2\frac{1}{2}$ miles north-eastward of Tandjoeng Simora. A $2\frac{3}{4}$ -fathom (5^m0) patch lies about $1\frac{1}{2}$ miles southward and a 3-fathom (5^m5) patch $1\frac{1}{4}$ miles south-eastward of Tandjoeng Simora; a shoal, with a depth of less than half a fathom (0^m9) over it, lies about $1\frac{1}{2}$ miles east-south-eastward of the same point, and a 2-fathom (3^m7) patch lies about $1\frac{1}{4}$ miles south-eastward of Kampoenng Simora, situated close south-westward of Sungei Air Tiba. A reef, with a least depth of $3\frac{1}{2}$ fathoms (6^m4) over it, extends about 7 cables southward from Tandjoeng Bitsjara, and a $2\frac{1}{2}$ -fathom (4^m6) patch lies about the same distance westward of the point. (*Lat.* 3° 44' S., *Long.* 133° 48' E.).

A bank, with a depth of 8 fathoms (14^m6) over it, lies about 2 miles south-south-eastward of Tandjoeng Bitsjara.

Sungei Air Tiba divides into two branches about one mile within its mouth, the right branch being navigable for about one mile, and the left branch for about 3 miles; there is little tidal stream in the river.

Rede Kaimana.—Light.—This roadstead is situated off Kampoenng Kaimana, on the eastern shore of Kaimana baai, about 5 miles north-north-westward of Tandjoeng Bitsjara. The edge of the drying reef extends about half a mile off Tandjoeng Poweri, which lies close southward of Kampoenng Kaimana.

There is a prominent mosque in Kampoenng Kaimana, also a remarkable grotto southward of it. On nearing the village, the corrugated iron roof of the Custom house and a flagstaff near it will be identified. Kaimana is the headquarters of a Government official and is the residence of the Rajah Komisi of the district. There is a pier at Kaimana, with a depth of three-quarters of a fathom (1^m4) at its head.

A light is exhibited at the root of the pier. Sheltered anchorage may be obtained, in a depth of 5 fathoms (9^m1), about one cable from the head of the pier.

Coast.—Bitsjara baai, entered between Tandjoeng Bitsjara and the northern extremity of Namatotte, an island which lies about $3\frac{3}{4}$ miles east-north-eastward, is backed by high land. See view facing page 253. Two shoals, with depths of about $2\frac{3}{4}$ fathoms (5^m0) and three-quarters of a fathom (1^m4) over them, lie in the middle of the bay, about $4\frac{1}{4}$ and 5 miles, respectively, north-north-eastward of Tandjoeng Bitsjara. There are also some dangers on the eastern side of the entrance at the northern end of Koningin Sophia straat. Kampoenng Bitsjara lies on the eastern shore of the bay, about $1\frac{1}{4}$ miles northward of Tandjoeng Bitsjara. Sisiandang rivier flows into the bay on the western side near the head. Kampoenng Sisi stands at the head of the bay.

Koningin Sophia straat.—Anchorages.—This strait, separating Namatotte from the mainland, connects with Bitsjara baai at its northern end and with Triton baai at its southern end. Both sides of the strait are high and rocky.

Namatotte has a narrow mountain range which slopes steeply to the sea, except near its northern end which is lower and less steep. Platte heuvel, 808 feet (246^m3) high and flat-topped, situated at the southern end of the island is prominent. The passage between the southern extremity of Namatotte and Sagin (*Lat.* 3° 52' S., *Long.*

Charts 942b, 2759a.

Chart 2102.

133° 55' E.), an islet, 402 feet (122^m5) high, should not be attempted.

The northern end of the strait is encumbered with reefs and should not be used. It was reported, in 1939, that the coastal reef extended 5 nearly 1½ cables farther northward and eastward from the northern extremity of the island than is shown on the chart.

The tidal streams are sometimes strong, especially in the northern part, where eddies and tide rips frequently occur in the vicinity of the reefs.

10 Anchorage may be obtained in most parts of the strait. Raaf (Raf) baai, on the eastern side, affords a safe anchorage to small vessels with local knowledge at all times. The entrance, however, is narrow, and a reef, which dries about 3 feet (0^m9), and is, at other times, marked by discoloration, extends from the northern side, and there 15 are several reefs in the inner part of the bay. At the head there is a narrow channel, navigable for boats, leading to the mouth of a river.

Anchorage may be obtained by small vessels with local knowledge in Java baai, situated at the southern end of Namatotte, in a depth of about 10 fathoms (18^m3); the bay is very confined, however, and 20 the anchorage is not out of the influence of the tidal streams.

Triton baai.—Anchorage.—This bay is entered between Tandjoeng Aiwa, the eastern entrance point of the southern end of Koningin Sophia straat, and the north-western extremity of Aidoema (Aiduma), which lies about 6½ miles south-eastward. The shores are high and 25 rocky, except at the head, where Tombona rivier flows out. (*Lat.* 3° 45' S., *Long.* 134° 07' E.). See view facing page 253.

Several islets lie in the entrance of, and inside, the bay, but except for Noesoeroemi (Nusurumi), situated in the middle of the bay, from the eastern side of which a reef extends, they can all be closely 30 approached. A one-fathom (1^m8) patch lies about half a mile northward of Kowika, an islet, situated off the south-western end of Noesoeroemi. Maoewara (Mauwara) and Semisarom lie on the western side; the channel between them and that between Maoewara and the mainland are not navigable by large vessels and the latter is even 35 difficult for boats.

A 3-fathom (5^m5) patch lies about half a mile southward of Laoezaro, an islet situated about 2½ miles westward of the north-western extremity of Aidoema. A 3¾-fathom (6^m9) patch lies about 1½ miles north-north-eastward of the latter point.

40 Good anchorage may be obtained at the head of the bay off Kampoeng Lobo, and also in the eastern part of the bay, in the narrow passage between two islets and the mainland. Vessels proceeding to the anchorage off Lobo, after rounding Tandjoeng Koemoera (Kumura) on the western side, should close the western shore, as the south-western 45 edge of the reef, which dries, off the mouth of Tombona rivier, is very steep-to, and, owing to the muddy water, cannot be distinguished.

The small inlet close northward of Tandjoeng Aiwa is only accessible for small craft.

Straat Iris.—Anchorages.—This strait, separating Aidoema from 50 the mainland north-eastward, is deep in the fairway and clear of dangers, but the tidal streams are strong, especially in the north-western entrance, off Saroeë Noes (Saruë Nus), an islet close off the north-eastern extremity of Aidoema, where the navigable channel is only half a mile wide.

Charts 942b, 2759a.

Chart 2102.

There are two peaks on Aidoema, the higher of which has an elevation of 1,622 feet (494^m4), but they are difficult to identify. Kampoeng Aidoema (*Lat. 3° 55' S., Long. 134° 02' E.*) stands on the north-western extremity of the island. The north-eastern shore of the strait is uninhabited, except for a village situated about 4½ miles south-eastward of the north-eastern entrance point. 5

Anchorage may be obtained by vessels with local knowledge, in the inlet on the north-eastern side of the strait, about 3½ miles eastward of Saroeë Noes, also in Mangkawoe, an inlet, situated about 6½ miles farther south-eastward. 10

The inlet on the north-eastern side of Aidoema, entered 4½ miles south-eastward of Saroeë Noes, affords good anchorage for a small vessel with local knowledge, but it is restricted by the coastal reef, with a depth of 1½ fathoms (3^m2) over it, which extends some distance offshore. 15

Dramai, an island lying south-eastward of Aidoema and in the southern entrance to Straat Iris, is hilly and partially cultivated. Moderately good anchorage may be obtained, in a depth of 13 fathoms (23^m8), about 8 cables eastward of the north-western point of the island, which is low compared with the other part. Southward of this anchorage is a creek, which probably flows through to the west coast. 20

Kajoe Merah baai.—Kajoe Merah baai (Kayu Merah bay), entered between Tandjoeng Nambima, a high and steep point, situated about 3 miles eastward of the southern extremity of Dramai, and Tandjoeng Awoera (Awura), about 12 miles farther eastward, is fronted by Kajoe Merah, an island, which has two prominent peaks, 1,819 and 1,248 feet (554^m4 and 380^m4) high, on its southern side. The southern and western sides of the island are steep and rocky, elsewhere it slopes gradually. Close westward of the western extremity is Salakoela, an island, with a deep channel about 3 cables wide between it and Tandjoeng Wandala, situated 2 miles north-eastward of Tandjoeng Nambima; there is no navigable channel between Salakoela and Kajoe Merah. Several islets lie on a reef, which dries, close off the northern point of Kajoe Merah; the passage between them and the point is only suitable for boats. 30

On the western side of the bay, entered between Tandjoeng Wandala and Tandjoeng Sawara Sekai, which lies about 3½ miles north-north-eastward, is an inlet clear of dangers, the shores of which are bordered by high cliffs. 40

Southward of Tandjoeng Wikromboes, situated about 3 miles northward of Tandjoeng Sawara Sekai, is a small bay, almost closed by a reef extending 6 cables south-south-eastward from that point, and by a one-fathom (1^m8) reef, lying in the entrance. North-westward of Tandjoeng Wikromboes, at the head of the bay, Airawoi rivier, navigable only by boats, flows into a small cove, the shores of which are covered with mangroves. At low water, when the reefs can be seen, this cove can be entered. 45

Three islets lie in the middle of the eastern entrance of Kajoe Merah baai, with a deep and clear channel on either side of them. The eastern shore of the bay between Tandjoeng Awoera and Tandjoeng Ferai, about 5½ miles north-westward, is steep and rocky, thence to the entrance to Airawoi rivier, it is mostly low, fringed by a reef 50

Charts 942b, 2759a.

Chart 2102.

which dries, and covered with mangroves; farther inland the mountains rise steeply. See view facing page 253.

Two rocks, with depths of $4\frac{1}{2}$ and $1\frac{1}{2}$ fathoms (8^m7 and 2^m3) over them, lie about 2 and $2\frac{1}{2}$ miles, respectively, north-westward of Tandjoeng Ferai (*Lat.* $3^\circ 58' S.$, *Long.* $134^\circ 26' E.$). The western extremity of the islet, lying about $1\frac{1}{2}$ miles north-westward of Tandjoeng Awoera, in line with the north-eastern extremity of the northern large islet lying off the eastern extremity of Kajoe Merah, bearing 127° astern, leads south-westward of these dangers.

Bocht van Lakahia.—**Buoy.**—This bay is entered between Tandjoeng Awoera and Tandjoeng Bohia, situated about $8\frac{1}{2}$ miles south-eastward. Lakahia, lying in the entrance, is a low island covered with high trees, and fringed by a reef, which extends about one mile from its western side.

Tandjoeng Awoera is steep and rises close within to an elevation of 1,696 feet (486^m5). Tandjoeng Bohia is low, and from it a spit, which dries, extends about one mile westward, and a bank, with depths of less than 5 fathoms (9^m1) over it, extends about $3\frac{1}{2}$ miles south-westward and about $2\frac{1}{2}$ miles southward where there is a rock which dries 2 feet (0^m6). Bohia, a hill, 359 feet (109^m4) high, lies about $1\frac{1}{2}$ miles east-south-eastward of Tandjoeng Bohia. The western shore of the bay is high and steep, but the eastern shore is low and mostly occupied by an extensive bank with depths of less than 3 fathoms (5^m5) over it.

The channel between Tandjoeng Bohia and the island Lakahia is very narrow at the northern end, and very steep-to off the reef extending from the north-eastern point of the island; this passage should not be used without local knowledge. The entrance between the island Lakahia and Tandjoeng Awoera is wide and deep. Tandjoeng Tarella which lies about 8 miles north-north-eastward of Tandjoeng Bohia, is a low, wooded, sandy point, about a mile south-westward of which there is a sandbank, which dries. About three-quarters of a mile farther westward is Karang Japbari, with a least depth of $1\frac{1}{2}$ fathoms (2^m3) over it.

There is a deep, though narrow channel to Etna baai, close along the western shore, but it is not recommended on account of a rock, over which there is a depth of 2 feet (0^m6), off Tandjoeng Etaboeri, which lies about $6\frac{1}{2}$ miles east-north-eastward of Tandjoeng Awoera, and a sandbank, with a depth of $1\frac{1}{2}$ fathoms (3^m2) over it, situated north-eastward of Tandjoeng Wariwi, about $2\frac{1}{2}$ miles farther north-eastward. Two shoals, with depths of $1\frac{1}{2}$ and $2\frac{1}{2}$ fathoms (3^m2 and 5^m0) over them, lie, respectively, about three-quarters of a mile south-eastward and the same distance eastward of Tandjoeng Etaboeri; the southern of these two shoals is marked by a buoy on its northern side. A safer passage, with a depth of 6 fathoms (11^m0), lies between the bank, which dries, westward of Tandjoeng Tarella, and Karang Japbari. A village stands on the northern side of Tandjoeng Tarella.

Anchorage.—**Directions.**—There is good holding ground everywhere in Bocht van Lakahia. During the South-east monsoon the swell runs north-north-westward, but a fair berth may be obtained off Kambelangan rivier, which discharges on the northern side of the bay, about $4\frac{1}{2}$ miles north-eastward of Tandjoeng Awoera. During the North-west monsoon there is good anchorage eastward of Tandjoeng

Charts 942b, 2759a.

Chart 2102.

Amanmawa, situated about $2\frac{1}{2}$ miles east-north-eastward of Tandjoeng Awoera.

A vessel approaching from southward can identify the entrance of Bocht van Lakahia by the mountain ridge of Boeroe (page 262), which is isolated and close to the coast, and cannot be mistaken for the high coastal mountains farther westward, nor for the islands westward of the bay. When nearing the coast, the hill, Bohia, will be sighted before the land between Tandjoeng Bohia and Tandjoeng Nariki (chart 942b), which lies about 14 miles east-south-eastward, then Lakahia and the entrance to the bay will be seen.

Etna baai.—Dangers.—This narrow, landlocked inlet is about three-quarters of a mile wide at its entrance between Tandjoeng Bawia (*Lat.* $3^{\circ} 56' S.$, *Long.* $134^{\circ} 40' E.$), situated 3 miles north-north-eastward of Tandjoeng Tarella, and Tandjoeng Itéwi, both steep projections. The latter point is steep-to, but on the eastern side several rocks, which dry, extend nearly a cable offshore between Tandjoeng Oeloepala (Ulupala) and Tandjoeng Bawia, and a sandbank, which dries, lie close off Tandjoeng Oeloepala. The northern side of the bay is mountainous, the highest point of Bamana gebergte, situated about $2\frac{1}{2}$ miles north-eastward of Tandjoeng Bawia, having an elevation of 4,496 feet ($1,370^m$); the shore is steep in places, but alternates with marshy land covered with mangroves. The southern side is similar to the northern, but the mountains lie in detached groups, which makes the coast more open, and has a perceptible effect on the weather conditions. In the western part of the bay, northward of the western entrance point, is a waterfall which falls gradually from a height of about 650 feet (198^m). Emborra rivier flows out about one mile south-westward of the waterfall.

There is a settlement, on the northern shore, situated about one mile north-eastward of Tandjoeng Itéwi; there is a small stone jetty here, probably the remains of a pier.

Oremma rivier, the principal river in Etna baai, flows out on the southern side of the bay, southward of Tandjoeng Jaramabonga, about $4\frac{1}{2}$ miles eastward of Tandjoeng Bawia, and is navigable for about 3 miles; the banks are mostly mud. Oewawa (Uwawa) rivier flows out on the northern shore opposite Oremma rivier, but it is unimportant and divides into several branches.

The depths in the bay vary considerably, the narrowest parts being the deepest; the eastern part of the bay is shallow, but a channel, with depths of more than 5 fathoms (9^m) in it, extends to within $5\frac{1}{2}$ miles of the head, and 3 fathoms (5^m) can be carried 3 miles farther.

A 4-fathom (7^m) patch lies about 3 cables north-eastward of Tandjoeng Itéwi. A shoal, with a depth of half a fathom (0^m) over it, lies on the northern side of the bay about 3 cables offshore, close westward of Tandjoeng Saimba, situated about $3\frac{1}{2}$ miles eastward of Tandjoeng Bawia.

Northward of Tandjoeng Jaramabonga are two narrow banks of mud, and sand, with depths of 2 and $2\frac{1}{2}$ fathoms (3^m and 4^m) over them, respectively, and 8 cables eastward of the northern of these banks is a 3-fathom (5^m) patch, lying $1\frac{1}{2}$ cables offshore.

A steep-to reef which partly dries, lies in the middle of the narrow channel northward of Seriwi gebergte, which are 1,816 feet (553^m)

Charts 942b, 2759a.

Chart 2102.

high, situated about $2\frac{1}{2}$ miles south-eastward of Tandjoeng Jaramabonga; the deepest channel, which should be used, is southward of the reef.

- 5 A bank, over which there is a depth of less than 3 fathoms (5^m5), extends 4 cables offshore over a distance of more than a mile, from the western side of a point situated 6 miles eastward of Tandjoeng Jaramabonga.

Anchorage.—**Directions.**—Anchorage may be obtained anywhere
10 in Etna baai; it is, however, not desirable to anchor in the narrow parts, nor in the bight at the western end northward of Tandjoeng Itéwi, on account of the swirls and bad holding ground.

After passing Tandjoeng Amanmawa a vessel should steer for the southern entrance point of the river situated about $1\frac{1}{2}$ miles south-
15 south-eastward of Tandjoeng Bawia (*Lat.* $3^{\circ} 56' S.$, *Long.* $134^{\circ} 40' E.$) bearing 066° , crossing a bar, in a depth of about $3\frac{1}{2}$ fathoms (5^m9), between Karang Japbari and the drying shoals on the eastern side of the channel, until Tandjoeng Bawia bears 040° when she should keep it so; when Tandjoeng Wariwi bears 290° , she can steer for the entrance to
20 Etna baai.

On entering Etna baai, she should keep on the deep western side by Tandjoeng Itéwi on account of the sandbank, which dries, between Tandjoeng Oeloepala and Tandjoeng Bawia, which considerably reduces the width of the navigable channel. As Tandjoeng Saimba opens clear of
25 Tandjoeng Bawia, she should haul gradually eastward and, when about 2 miles eastward of the latter, keep on the southern side of the channel to avoid the bank westward of Tandjoeng Saimba. If the tidal stream is strong, she should give this point a good berth, on account of the eddies, and keep along its eastern side; as the channel up the bay
30 eastward of Tandjoeng Jaramabonga opens out, she should cross over and keep along the northern side of that point and along the southern shore, until past the reef which dries in the narrowest part of the channel abreast Seriwigeberge, after which she should haul gradually over to the northern shore, until abreast the steep headland, situated
35 $2\frac{1}{2}$ miles eastward of the reef, when she should keep a prominent spur of the mountains on the southern shore bearing 116° , which leads towards the head of the bay. The channel narrows here considerably, and is steepest on the northern side; hence it is advisable to sound constantly on the southern side of the channel and alter course as
40 necessary.

Tidal streams.—The tidal streams in Etna baai are semi-diurnal and at springs usually have a rate of from 3 to 4 knots in the narrow parts. They follow the direction of the channel, and, where the turns are sharp, and, at the reef, which dries, in the narrow part of the bay,
45 eddies are formed, necessitating careful steering; in the bight northward of Tandjoeng Itéwi, especially, the streams have a continuous turning motion.

Chart 3246.

Tandjoeng Bohia to Oeta rivier.—**Coast.**—The most prominent
50 points on this stretch of coast are Tandjoeng Nariki and Tandjoeng Namaripi, which lie about 14 and 40 miles, respectively, east-south-eastward of Tandjoeng Bohia. Tandjoeng Nariki is a spur from the mountain ridge of Boeroe (Buru), the summit of which is 4,334 feet (1321^m0) high, and lies about 8 miles eastward; this ridge runs in an

Chart 2759a.

Chart 3246.

easterly and westerly direction and is about 14 miles long. Tandjoeng Nariki may be identified by some large yellow patches on it. Tandjoeng Namaripi can be identified by a group of tall slender trees which appear as an islet from eastward.

There are several rivers on this part of the coast, one of which, Omba rivier, has an islet in its entrance. There is a channel on either side of this islet; in the western there is only a depth of one foot (0^m3) and there is surf in it at high water; in the eastern there is a depth of 4 feet (1^m2), but these depths are liable to change.

Between Tandjoeng Nariki (*Lat. 4° 15' S., Long. 134° 48' E.*) and the entrance to Boeroe (Buru) rivier, situated about 9 miles east-south-eastward, the coast is rocky, thence it becomes low with hilly land inland. There is a village on the northern side of the entrance of Petawai rivier, situated about 9 miles south-eastward of Boeroe rivier, and a village stands on the eastern entrance point of Katéra rivier, which flows out about 3 miles east-south-eastward of Petawai rivier.

Japakopare rivier flows out about 2 miles east-south-eastward of Petawai rivier; Kampoeng Japakopare stands about a mile east-south-eastward of the river mouth.

Tandjoeng Namaripi or Vlakke hoek (*Lat. 4° 28' S., Long. 135° 12' E.*) is a steep headland, appearing from eastward as an island.

Charts 3246 and 942b.

Aspect.—From the vicinity of Tandjoeng Bohia, where the mountainous land reaches nearly to the coast, the entire coast eastward is low, muddy and covered with vegetation. The mountains are too far inland to be of any importance to navigation. Charles Louis gebergte run parallel to, and eastward of, Boeroe gebergte and extend eastward to Sneeuw gebergte, the western part of which is named Nassau gebergte, the highest peaks of which, from westward, are Idenburg Top, covered with snow, and Carstensz Toppen, with two peaks, both covered with snow. About 80 miles farther eastward, is Oranje gebergte, with Emma Top, on which there is no snow; Wilhelmina Top, on which there is usually snow, stands about 12 miles east-south-eastward; and about 100 miles farther in the same direction, is Juliana Top, covered with snow. These mountains are all nearly 16,000 feet (4876^m8) high, but are seldom visible by day, except in the early morning or just after sunset, when they may be seen in clear weather as far south as *Lat. 5° 30' S.*, but they are usually covered by dense clouds.

Chart 3246.

Coast.—Beacons.—The vegetation on the generally muddy coast consists of mangroves varied by coconut trees, with occasional strips of sand by the sea. Behind the coast there is extensive marshy land, which extends as much as 40 miles inland.

Between Tandjoeng Namaripi and the mouth of Oeta rivier, situated about 50 miles east-south-eastward, several rivulets flow out, the principal being the Oemar (Umar), Jera and Paraoka, 9, 23 and 31 miles, respectively from Tandjoeng Namaripi; there are a number of villages on this coast. In front of the mountains there are numerous hills, whether they show up or not depends on the lighting. With favourable sunlight fully on it, a flat ridge, situated northward of Oeta, stands out and resembles a coffin. A salt water swamp extends behind the beach, which is overgrown with casuarina trees; this growth makes

Chart 2759a.

Chart 3246.

the coast at the mouth of the Paraoka appear as a prominent point when navigating close offshore.

Oeta (Uta) rivier, with two unofficial white boards at its mouth, is about $3\frac{1}{2}$ cables wide at its entrance and maintains a width of not less than one cable for a considerable distance.

Oeta rivier to Poeloe Naurio.—Coast.—Beacons.—Anchorages.

—Only the wider mouths of the rivers on this stretch of coast afford any landmarks; banks extend a considerable distance from some of them.

10 Vessels anchoring off this coast when there is a somewhat high sea or swell should do so in depths of not less than 39 feet (11^m9).

The mouth of Makemaw (Bokamau) rivier, situated about 8 miles east-south-eastward of that of Oeta rivier, is distinctive. The western entrance point projects sharply, and the eastern point, from which a
15 bank, which dries, extends 2 miles south-westward, appears as two islets; there are some small detached drying parts on the shoal bar in the entrance channel so that only boats can enter.

The shore bank extends for about 3 miles southward of the western entrance point with depths of 11 and 15 feet (3^m4 and 4^m6) at its
20 southern end; sounding gives no warning when coming from southward.

Chart 942b.

The rivers between Makemaw and Mimika rivieren, situated about 21 miles east-south-eastward, are only accessible for praus. During the South-east monsoon there is usually a considerable sea or swell here.

25 The mouth of the Mimika can be identified by an unofficial white triangular board which marks the southern point of the island on which Kampoeng Kokonao (*Lat. 4° 42' S., Long. 136° 27' E.*), stands; this beacon, however, disappeared in 1950. Caution is necessary when approaching, as the depths decrease rapidly. Good anchorage may be obtained by vessels with local knowledge, in a depth of 11 fathoms
30 (20^m1), with the head of the landing jetty bearing 014°. The river is only available for small craft, with local knowledge, at high water. A narrow channel, winding between large sandbanks, which continually shift, leads to the mouth, which is about half a cable wide. The shores
35 are low, marshy, and overgrown with mangroves; the banks at the entrance are bordered by a strip of sand, partly covered with trees, on which there are some primitive dwellings. Kampoeng Kokonao is the headquarters of a Government chief; the inhabitants are friendly.

Keakwa rivier flows out about 5 miles south-eastward of the
40 Mimika, and a few miles farther is the mouth of the Timoecka. In the channels approaching both rivers there is a depth of not more than half a fathom (0^m9). Vessels bound for Mimika go inside Baai van Keakwa where there is anchorage. There is a depth of about one fathom (1^m8) on the bar of this bay and about 2 fathoms (3^m7) in
45 the bay. Keakwa rivier has a bar, which does not silt up, with a depth of half a fathom (0^m9) over it. The banks of Keakwa rivier consist of mangroves, with an occasional small sandy beach, on which the huts are built. A few miles up the river there are coconut and sugar-cane plantations.

50 A large white board stands on the western entrance point of Keakwa rivier.

A beacon, surmounted by a white triangle stands, close south-eastward of Kampoeng Keakwa, on the coast about half a mile south-eastward of the mouth of Keakwa rivier.

Chart 2759a.

Chart 942b.

Between the Mimika and Keakwa rivieren depths of 5 fathoms (9^m1), or less, extend up to a distance of 2 miles offshore and a shoal, with a depth of 2½ fathoms (5^m0) over it, lies about 2 miles south-westward of the mouth of Keakwa rivier.

About 6 miles south-eastward of Keakwa rivier is the mouth of Atoeka rivier, in which there is an island. The villages of Keakwa, Timoecka and Atoeka stand at the mouths of the rivers of the same names. Wania rivier, is situated about 5 miles south-eastward of the Atoeka. About 5 miles north-westward of Poeloe Naurio, Tipeoka (Aika) rivier flows out, through two mouths, near Kampoeng Apiripi. The western mouth is named Oehoeroepao. Kampoeng Amamapare stands on the eastern bank about 2 miles above the mouth.

Wajeteri, Naurio and Poeriri (Puriri) are prominent islets lying westward of the wide mouth of Newerip rivier, which flows out eastward of Poeloe Naurio. See view facing page 266. Wajeteri and Naurio are covered with high trees; Poeriri is atoll-shaped and in the middle of it there is a basin, thickly covered with vegetation, with an opening on its western side; it is bordered by a high sandy beach. The bay eastward, into which Newerip rivier flows, is shallow and is not accessible for vessels. Newerip rivier has not been examined.

A bank extends south-westward and southward from Poeloe Naurio (Lat. 4° 56' S., Long. 136° 51' E.) a depth of 4 fathoms (7^m3) having been obtained about 5 miles southward of the mouth of Tipeoka rivier, and breakers were observed with a slight swell.

Anchorage may be obtained by vessels with local knowledge, in a depth of 5 fathoms (9^m1) off Poeloe Naurio, with the western extremity of Poeriri bearing 005°, and the mouth of Inaboeka rivier, 084°. The depths shoal rapidly from 10 to 4 fathoms (18^m3 to 7^m3), so it is advisable, when approaching the coast on a northerly course, to reduce speed and sound countinuously.

Poeloe Naurio to Flamingo baai.—Coast.—Anchorage.—The only good landmarks on this stretch of coast are Laag eiland and Klein eilandje, which lies about 60 miles south-eastward of Poeloe Naurio, and the trees at the mouths of Kasteel, Bloemen, Hellwig and Lorentz rivieren.

A mudbank, with depths of less than 3 fathoms (5^m5) over it, extends from 12 to 13 miles offshore in places, and on which there are a number of shoal patches, which are described with that part of the coast off which they lie.

Many of the rivers form the only means of communications through the extensive marshy land to the hills far inland. In the vicinity of the hills and northward of them they are unserviceable on account of obstructions, rapids and rocky banks. All these rivers are connected by streams, by which a boat with a draught of about 5 feet (1^m5) and a length of about 80 feet (24^m4) can proceed from Otakwa rivier (see below) to Eilanden rivier (page 268), a distance of about 270 miles. There are few villages in this part; in the plain they are situated on the banks of the rivers. The inhabitants live by hunting, fishing and a little agriculture. Coconut trees are not seen anywhere.

Koepera Poekwa (Kupera Pukwa) rivier, with an entrance 3 miles wide, flows out about 12 miles eastward of Poeloe Naurio. An extensive sandbank, which dries and is steep-to, lies near the western entrance point of the river. Anchorage may be obtained by vessels

Chart 2759a.

Chart 942b.

with local knowledge with the eastern entrance point bearing 050°, distant 8 miles. Heavy breakers have been observed on the coast between Newerip rivier and Koepera Poekwa rivier.

- 5 Inaboeka rivier, which flows out about 5 miles south-eastward of Koepera Poekwa rivier, had, in 1903, a depth of $1\frac{1}{2}$ fathoms (3^m2) on its bar.

The following directions were compiled in 1904, but changes may have since taken place.

- 10 From a position with the eastern entrance point Koepera Poekwa rivier bearing 000°, and the western entrance point of Inaboeka rivier, 038°, in a depth of 4 fathoms (7^m3), a course 033° leads over the bar, which is one mile across, in a depth of less than $2\frac{1}{2}$ fathoms (5^m0). When these points bear 343° and 043°, respectively, alter course to 15 060°, which leads in mid-channel, in depths gradually increasing to 5 fathoms (9^m1). When the above points bear 312° and 009°, respectively, steer 030° through the middle of the entrance, in depths of over 5 fathoms (9^m1). A village lies on the western bank of the river. The maximum rate of the stream is $1\frac{1}{2}$ knots.

- 20 Otakwa rivier flows out about 5 miles east-south-eastward of Inaboeka rivier. See view facing this page. The following directions for entering the river were compiled in 1936, but they should be used with caution, as it is possible that changes in the sandbank and bar may have since taken place.

- 25 To enter the river steer for the eastern entrance point of Inaboeka rivier, bearing 003°, until the western entrance point of Otakwa rivier bears about 045°, when steer for it on that bearing. When the sandbank, covered with vegetation, situated about $2\frac{1}{4}$ miles southward of this point, bears 120°, steer for the high clump of trees standing on the 30 eastern entrance point (*Lat. 5° 00' S., Long. 137° 13' E.*), bearing 063°, until the sandbank, mentioned above, bears 195°, when steer 032°, which leads into the river, close to the western entrance point. During the strength of the South-east monsoon, the bar is impassable. The river is difficult to navigate and is only available for a short distance.

- 35 There is a settlement at the mouth of the river.

There are several rivers between Otakwa and Kasteel rivieren, situated 35 miles south-eastward, the principal of which are Ipoeakwa, Amboekerah, Akimeugah, Groot Moeras (Great Muras) and Torpedoboot rivieren, all of which connect with one another. Ipoeakwa,

- 40 Akimeugah and Torpedoboot rivieren are only navigable for a short distance. Amboekerah rivier, which is about $2\frac{1}{4}$ cables wide at its mouth, with a depth of $3\frac{1}{2}$ fathoms (6^m9) in it, has been ascended for a distance of about 20 miles, where its width is about a quarter of a cable, and its depth 11 feet (3^m4).

- 45 Ka steel rivier, off the entrance to which is the island of the same name, may be identified by three distinctive trees on the western side of the entrance. Kasteel eiland is lower in the middle than at the ends, and resembles a castle with battlements; it is connected to the coast by a mudbank which dries. A channel, with a depth of $1\frac{1}{2}$ 50 fathoms (2^m7) in it, leads into the river. A short distance inside the entrance the river divides into two branches, the eastern of which connects with Bloemen rivier. The western branch is navigable a considerable distance.

The channel leading to Bloemen rivier, which is entered about

Chart 2759a.

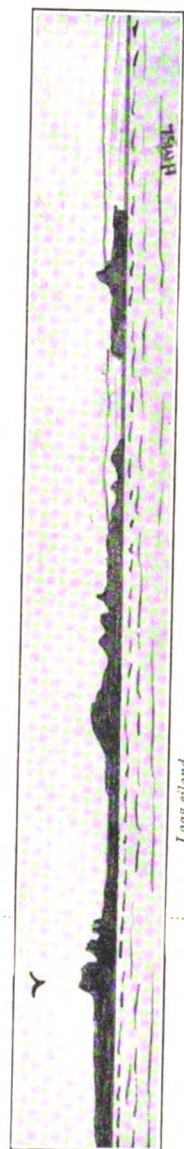
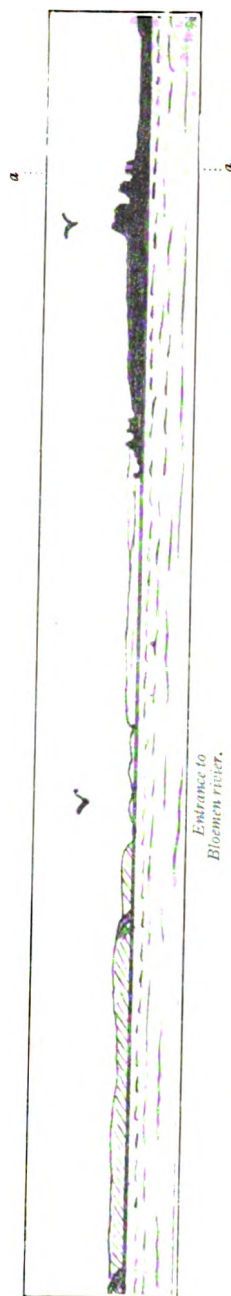


South-west coast of New Guinea.

(Original dated 1933.)

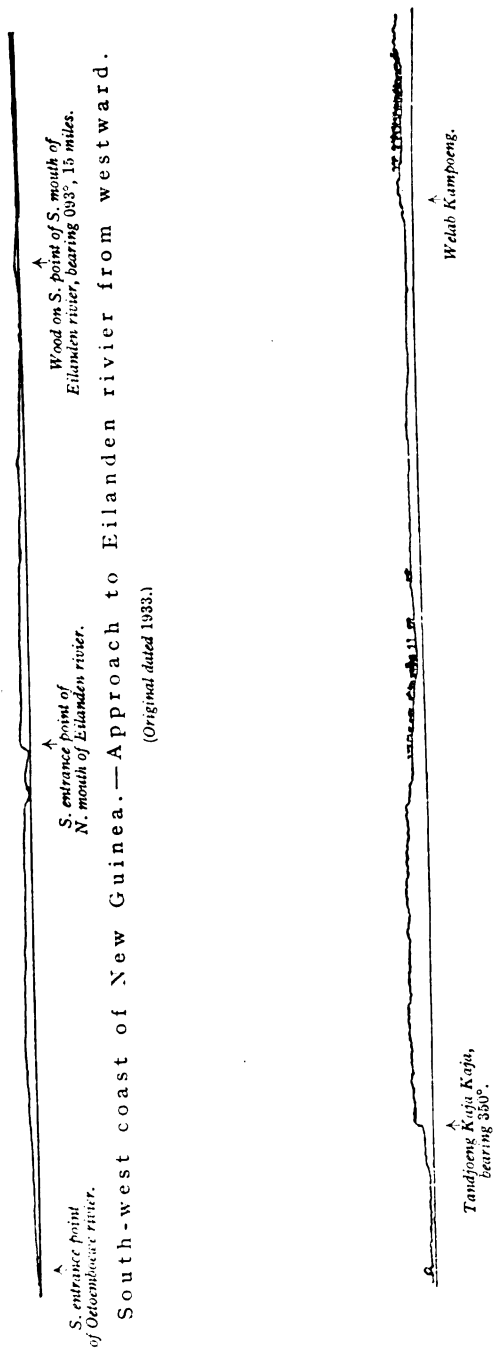


South-west coast of New Guinea.—Approach to Otakwa rivier from south-westward.
(Original dated 1933.)



South-west coast of New Guinea.—View, in two parts, of approach to Bloemen rivier from south-westward.
(Original dated 1936.)

To face page 267.



South coast of New Guinea.

(Original dated 1933.)

Chart 942b.

7 miles south-eastward of Kasteel rivier, passes north-westward of Laag eiland; the river is navigable by vessels with local knowledge, with a draught of 11 feet (3^m4), for a distance of about 30 miles, where it is connected with Le Cocq d'Armandville rivier by a channel navigable by boats with a draught of 6 feet (1^m8). See view facing page 266. A power boat can proceed a further 15 miles up river. As there is a least depth of 1½ fathoms (2^m3) on the bar at the mouth of Le Cocq d'Armandville, this river as a rule, is not navigable by a vessel with a draught of 12 feet (3^m7). 5 10

Laag eiland, situated about 5 miles south-south-westward of the entrance to Bloemen rivier, is low and covered with vegetation; it is joined to the mainland at low water. Klein eilandje (*Lat.* 5° 23' S., *Long.* 137° 46' E.) lies about 4 miles eastward of Laag eiland and one mile offshore. 15

Hellwig rivier, which flows out about 8 miles south-eastward of Bloemen rivier, is nearly half a mile wide at its mouth, and is approached through a channel with a depth of 2½ fathoms (5^m6). It is navigable by a vessel with local knowledge, with a draught of 11½ feet (3^m6), for a distance of about 30 miles, where the width is about 80 yards (73^m2), and there divides into two branches, the western of which is accessible to a steamboat for a distance of about 6 miles; the eastern branch connects with Noordwest rivier. The vicinity of the river is fairly well populated, and the inhabitants are friendly. 20

Off-lying danger.—De Jong's bank, with a depth of 1½ fathoms hard sand, lies about 19 miles westward of Kasteel eiland (*Lat.* 5° 16' S., *Long.* 137° 38' E.), and about 10 miles offshore. 25

Chart 2759a.

Flamingo baai.—**Off-lying danger.**—This bay, entered about 10 miles south-eastward of Hellwig rivier, receives the waters from Noordwest, Lorentz and Oetoemboewe rivieren. 30

Noordwest rivier is about 7 cables wide at its mouth, but inside decreases rapidly to about 80 yards (73^m2); it is navigable by a vessel with local knowledge, 164 feet (50^m0) in length, and a draught of 11½ feet (3^m6), for about an 8-hour journey. 35

In the upper part the river divides at each of three places into two arms, the last division joining again higher up. When the river is at its normal height, from the middle of October to the middle of April, the so-called little rainy season, a power boat can reach the third point of division in two days, whence the mountains can be reached in three days by canoe. When the water is low a power boat can only ascend as far as the first bifurcation. 40

Noordwest rivier is connected with Hellwig rivier by a navigable branch. There are several villages on the river, the inhabitants of which are friendly. 45

Lorentz rivier, which flows out at the head of the bay, is navigable by vessels of 11½ feet (3^m6) draught, and 164 feet (50^m0) in length, to just below Dumas rivier, a tributary which joins the main stream in about lat. 5° 03' S. A power boat can ascend as far as 4° 47' S., and a canoe to 4° 40' S. From this point the Lorentz expedition, in 1909, after a trip of 25 days, reached Wilhelmina Top (page 263), situated 24 miles northward. The natives along the banks of this river were friendly. 50

Oetoemboewe rivier is navigable for about 50 miles by a vessel with

Chart 780.

Chart 2759a.

local knowledge with a draught of about 12 feet (3^m7), and a length of 164 feet (50^m0), and beyond this by a power boat for 20 miles farther. A wide tributary on the right bank is navigable by a power boat for 19 miles.

Chart 942b.

Providentiaal bank, with a depth of 2½ fathoms (4^m1) near its western extremity, extends about 13 miles westward from the south-eastern entrance point of Flamingo baai.

10 *Charts 942b and 2759a.*

A vessel approaching Flamingo baai should keep in depths of over 6½ fathoms (11^m9) until the eastern bank of Lorentz rivier bears 031°, when she should steer for it on that bearing, passing south-eastward of a 2½-fathom (5^m0) patch, situated about 17 miles south-south-westward of the north-western entrance point of the bay.

Chart 2759a.

Flamingo baal to Kaap Valsch.—Coast.—The extensive bight between Flamingo baai and Kaap Valsch, which lies about 170 miles southward, is occupied by a mudbank, with depths of from 3½ to 10 fathoms (6^m4 to 18^m3) over it. The mouths of the rivers do not afford any landmarks except close offshore.

Eilanden rivier.—This river has two mouths, the north-western of which is entered about 8 miles southward of Flamingo baai. *See* view facing page 267. The southern entrance is navigable by vessels with local knowledge with a draught of about 12 feet (3^m7) as far as lat. 5° 21' S., long. 139° 20' E. under favourable conditions. A vessel should approach this entrance with the southern entrance point, on which there is a wood, bearing 093°, which leads just clear of the bank, which dries, north-eastward of Triton bank (*see* below); the wood, however, is difficult to distinguish until a depth of 2½ fathoms (5^m0) is obtained; the southern entrance point of the northern entrance is a useful mark until then. A depth of 2½ fathoms (4^m6) can be carried through the channel over the bank to the southern entrance.

To enter by the northern entrance, a vessel should cross the outer bank by steering for the distinctive southern entrance point (*Lat.* 5° 54' S., *Long.* 138° 15' E.); there is a depth of only three-quarters of a fathom (1^m4) on this bank, and there is a similar depth above the first island above the delta. The upper reach of the northern arm is difficult to navigate owing to the numerous islands. The northern arm, about 20 miles within its entrance, is connected to Oetoemboewe rivier by Anna rivier, which is navigable by praus.

In 1925, it was found by the Netherlands Government steamer *Fomalhaut* that the left bank of the southern arm above the delta could be held as far as its junction with Kampoeng rivier, passing westward of the first island and northward of the second one. An islet in lat. 5° 31' S., long. 139° 06' E. should be passed on the northern side.

In approaching the northern mouth of the river, the yacht *Rosaura* reported, in 1935, that, from a position about 6 miles west-south-westward of the entrance, she steered for it, bearing 064°, which led, in a depth of 3½ fathoms (6^m4), to the entrance, within which she obtained depths of from 4 to 5 fathoms (7^m3 to 9^m1): the entrance should not, however, be attempted without local knowledge.

Vriendschaps rivier, which is the first large tributary flowing into

Chart 780.

Chart 2759a.

the right bank of Eilanden rivier, is navigable by a vessel with local knowledge, with a draught of $11\frac{1}{2}$ feet (3^m6) to the position where the first tributary flows into the right bank.

Brazza rivier and Kolff rivier, which flow into Eilanden rivier, 5 are navigable by vessels with local knowledge with a draught of $11\frac{1}{2}$ feet (3^m6), the former as far as lat. $4^{\circ} 47' S.$, long. $139^{\circ} 29' E.$, and the latter for a distance of about 40 miles.

Dojiaissi, or Oe, rivier, the first tributary flowing into the left bank of the southern arm, about 8 miles within its entrance, is about $1\frac{1}{4}$ 10 cables wide at its mouth, narrowing quickly to about three-quarters of a cable. It has been explored by a steamboat as far as lat. $6^{\circ} 00' S.$, long. $138^{\circ} 44' E.$, where the width is only about 50 feet (15^m2), the depth throughout being 17 feet (5^m2); the in-going and out-going streams are felt over the whole course of the river. The well populated 15 village of Biroefoe stands near the mouth of Dojiaissi rivier.

Kampoeng, or Asoeweh, rivier, the second tributary which flows into the left bank of the southern arm of Eilanden rivier, about 5 miles northward of the Dojiaissi, was easily identified by the Government steamer *Fomalhaut*, in 1925, and sufficient depths were found although 20 the river was not in flood. The channel is somewhat indicated by the stream and the type of vegetation; the water was very muddy.

Wildeman, or Passüwe, rivier, the first tributary flowing into the left bank of Eilanden rivier above the delta, has marshy banks with a heavy outlet, but fairly clear water. A vessel with local knowledge 25 with a draught of 6 feet (1^m8) can ascend to lat. $5^{\circ} 23' S.$, long. $139^{\circ} 32' E.$ About 30 miles from the entrance, the river divided into two branches.

Off-lying dangers.—Triton bank (Lat. $5^{\circ} 59' S.$, Long. $138^{\circ} 04' E.$) is the outermost sandbank, which dries, lying within 13 miles of the 30 southern entrance of Eilanden rivier.

Tidal streams.—Over the off-lying banks the tidal stream sets between north and north-north-east with the rising tide, and between south and south-south-west with the falling tide.

Coast.—Between Eilanden rivier and Digoel rivier (see below), 35 several unimportant rivers flow out, the two principal of which are Kronkel and Cook rivieren situated about 22 and 29 miles, respectively, southward of the southern entrance of Eilanden rivier. Kampoeng Birab stands on the northern bank of Kronkel rivier. Cook rivier flows into the head of an inlet, on the south-eastern side of which 40 there is a large village. There is a depth of $1\frac{1}{4}$ fathoms (2^m3) in the entrance of Kronkel rivier, and three-quarters of a fathom (1^m4) in that of Cook rivier.

Caution.—Extreme caution should be exercised in approaching the coast in the vicinity of Digoel rivier and Prinsses Marianne straat; 45 the depths in this area were reported, in 1955, to vary considerably from those charted.

Digoel rivier.—This river rises in Sneeuw gebergte, near the boundary of Netherlands and British New Guinea. About 55 miles eastward of De Jong's punt, situated 65 miles south-south-eastward of 50 the southern entrance of Eilanden rivier, Digoel rivier divides into two parts, of which the northern delta arm is named Kawarga as far as its junction with its tributary Mappi, situated about 40 miles within De Jong's punt, whence it is known as Odammoen rivier; it flows

Chart 780.

Chart 2759a.

into the sea northward of De Jong's punt through three mouths, named from northward, Maboer, Majoe and Viarre. The southern delta arm bears the name of the main river and flows out between
 5 De Jong's punt and Modderhoek, which lies about 21 miles south-south-eastward.

The coast in the vicinity of the delta is low, muddy, and covered with jungle, which is flooded at high water, and consequently there are few landmarks. De Jong's punt and Modderhoek cannot be distinguished
 10 at a distance seaward. The only distinctive mark is a sandy beach, about $2\frac{1}{2}$ cables long, situated near De Jong's punt (*Lat.* $6^{\circ} 55' S.$, *Long.* $138^{\circ} 34' E.$), where the coast trends south-eastward.

Both the out-going and in-going tidal streams may be strong. At or near spring tides, with the first rise after low water, a bore or flood
 15 wave, about 6 to 10 feet (1^m8 to 3^m1) high, travels up Odammoen rivier. This wave, which appears as breakers, may be dangerous for small vessels. It ascends the river as far as Bade (*Lat.* $7^{\circ} 11' S.$, *Long.* $139^{\circ} 35' E.$) and above that place is only noticeable as a slight swell. A second bore travels up the southern delta arm and above
 20 the meeting of the two arms several tidal waves may be experienced.

Odammoen rivier is navigable at mean level by a vessel with local knowledge, with a draught of $11\frac{1}{2}$ feet (3^m6), through one of its mouths, to Digoel rivier. Mappi rivier is navigable by a similar vessel to approximately *lat.* $6^{\circ} 16' S.$, *long.* $139^{\circ} 51' E.$; above this it is only
 25 navigable by river craft. A vessel, with a draught of 6 feet (1^m8), can proceed one day's journey higher up, but beyond that the river, although apparently having sufficient depths, is too rapid. The district appears to be densely populated. There is very little current in the river.

30 Obaa rivier is a tributary of Mappi rivier and is connected to Wildeman rivier by Mijwawon rivier.

The southern delta arm, which is usually used, is approached through two channels through the banks in the mouth; one of these is along the northern shore, but is not navigable as it is encumbered with rocks
 35 which dry, and the streams are strong, with many eddies. The other one is the main channel, along the southern shore between Modderhoek and Zondagshoek, situated about 14 miles eastward, with a depth on the bar of about one fathom (1^m8).

The main river is navigable by vessels with local knowledge, with
 40 a draught of $11\frac{1}{2}$ feet (3^m6), and a length of 164 feet (50^m0). The principal tributaries of Digoel rivier are Ederah, Keebke riki, Kia, Oewamba and Oewimmerah rivieren.

Ederah rivier which flows into the right bank of Digoel rivier was ascended by the Netherlands Government vessel *Anna*, with a length
 45 of 82 feet (25^m0) and a draught of 6 feet (1^m8), for a distance of 40 miles. Its entrance is from about 160 to 200 feet (48^m8 to 61^m0) wide, with a least depth of about 5 fathoms (9^m1) in it. At the position reached by the *Anna* the river was still about 80 feet (24^m4) wide. The current in the river is weak.

50 Oewamba rivier is important to navigation on account of the Government settlement at Tanah Merah, situated about 50 miles above the junction of Oewamba and Oewimmerah rivieren, which lies 188 miles above Modderhoek (*Lat.* $7^{\circ} 12' S.$, *Long.* $138^{\circ} 42' E.$). It is navigable by vessels with local knowledge with a length of 82 feet

Chart 780.

Chart 2759a.

(25^m0) and a draught of 6½ feet (2^m0) for 330 miles from its mouth, that is, to about lat. 5° 20' S., long. 140° 27' E., where it is about 300 yards (274^m3) wide, with a depth of about 1½ fathoms (3^m2) in it. In lat. 5° 45' S., long. 140° 14' E. the river is about half a cable wide with a depth of 5 fathoms (9^m1) in it. 5

Mandobbe rivier, a tributary of Oewamba rivier, is about 100 feet (30^m5) wide at its entrance, with a depth of 5 fathoms (9^m1) in it, and flows through a well populated district, but is much encumbered by obstructions. 10

Oewimmerah rivier has been navigated for a distance of about 50 miles by a vessel with a length of 164 feet (50^m0) and a draught of 11½ feet (3^m6). The sharp bends, however, make navigation difficult. The Government vessel *Anna* has ascended to lat. 5° 29' S., long. 140° 44' E. The river is about half a cable wide at its junction 15 with Digoel rivier, about 90 yards (82^m3) wide at its junction with the Inggivakke, and about one day's journey above, this tributary is about 70 yards (64^m0) wide, with a least depth of about 3½ fathoms (6^m9) in it.

In the lower reaches of Oewimmerah rivier the banks are alternately 20 high and low, and covered with forest; higher up they gradually become hilly and are steep in places. The inhabitants in the district are friendly, and in the upper reaches are numerous.

Inggivakke rivier, the principal tributary of Oewimmerah rivier, flows into its left bank, where it is about 100 feet (30^m5) wide, with a 25 depth of 5 fathoms (9^m1) in it.

Tidal streams.—The in-going tidal stream is strongest in the channel along the northern bank in the entrance to the southern delta arm of Digoel rivier, and the out-going stream is strongest in the channel along the southern bank. In the latter the maximum rate of 30 the out-going stream was observed to be from 5 to 6 knots for some hours, and about 3 knots on the in-going stream, six days after full moon.

Between Modderhoek (*Lat. 7° 12' S., Long. 138° 42' E.*) and Schultz 35 hoek, situated on the northern bank, about 25 miles eastward, the streams changed 1½ hours after high and low water; on the outer bar the interval was less. In the channel along the northern bank, on the days between full moon and 4 days after, the in-going stream attained a rate of from 5 to 6 knots for several hours, and 2 days after full moon, about 3 hours after low water, it attained a rate of 7½ knots. 40 whilst the maximum rate of the out-going stream was only 3 knots. The in-going stream was observed to extend as far as the junction of Oewamba and Oewimmerah rivieren.

Directions.—A vessel approaching from north-westward should be careful not to mistake one of the mouths of the Odammoen for the 45 Digoel, and should steer for a position with De Jong's punt bearing 011°, distant 8 miles, where there is a depth of about 4½ fathoms (8^m2) and thence steer 125° to a position about 1½ miles northward of Modderhoek, until Gemeene hoek, situated on the northern bank of the river, about 10½ miles east-north-eastward of Modderhoek, bears 50 084½°; thence she should steer for Zondagshoek, bearing 096°, taking care to avoid the shoal, with a least depth of 1½ fathoms (2^m3) over it, lying north-eastward of Modderhoek, until Gemeene hoek bears 040°; thence she should follow the channel, passing northward of the

Charts 1044, 780.

Chart 2759a.

islet Habee Amman, southward of Habee Sillam, and westward of Ora Sillam, situated about 17, 28 and 34 miles, respectively, above Modderhoek (*Lat. 7° 12' S., Long. 138° 42' E.*).

- 5 **Outlying bank.**—Kolff bank, which lies about 100 miles westward of De Jong's punt, is a sandbank with a depth of 8 fathoms (14^m6) over it, with 19 fathoms (34^m7), mud around it.

Frederik Hendrik eiland.—This island, separated from the south-western coast of New Guinea by Prinses Marianne straat, is low, covered with dense forest and so marshy as to be almost inaccessible. The western side of the island is fringed by a mudbank with depths of less than 5 fathoms (9^m1) over it, extending 25 miles offshore.

The island is relatively thickly populated.

Chart 447.

- 15 **Kaap Valsch**, the south-western extremity of the island, is dangerous to approach from westward, as, at low water, it is possible to run aground before sighting land. The coastal bank on the southern side of the island is very steep-to, but with ordinary visibility the land should be sighted from that direction in depths of 9 or 10 fathoms
20 (16^m5 to 18^m3); the large rise and fall of the tide, however, must be taken into consideration.

Bad weather is usually experienced off Kaap Valsch. With any sea, as there usually is during the East monsoon, and frequently during the West monsoon, it is advisable to keep well away from
25 the coast, as otherwise a vessel will roll heavily. The tidal stream with the rising tide has been observed to set on to Kaap Valsch, and north-eastward and eastward of the north-western and southern sides, respectively, of the island, at a rate of 1½ knots. With the falling tide the stream sets in a contrary direction, at a rate of one knot.

- 30 *Charts 447, 2759a.*

Prinses Marianne straat.—Kaap Kolff, the northern extremity of Frederik Hendrik eiland, has some high trees on either side of it, which protrude a little above the adjacent forest. The land on either side of the strait is marshy, muddy, and covered with vegetation,
35 interspersed with occasional open spaces; there are numerous small creeks on both sides.

Moebke rivier flows out on the eastern side of the northern part of the strait. It is about a quarter of a mile wide at its entrance, with a depth of about 5 fathoms (9^m1); 6 miles up it is about three-quarters
40 of a cable wide, with a depth of 2 fathoms (3^m7), and 12 miles up, it is only about 20 yards (18^m3) wide, with a depth of half a fathom (0^m9).

The southern part of the strait is divided into two channels by Komoran eiland; the western channel is named Bensbach kreek, and the eastern the name of the strait.

- 45 **Bensbach kreek** has not been surveyed.

Tandjoeng Kombies (*Lat. 8° 16' S., Long. 138° 54' E.*), the eastern entrance point of the southern end of the strait, is a wooded headland which may be identified, especially from southward, by a large tree, the top of which bends over westward. Kaap Kool (Cape Kōl) is the
50 south-eastern extremity of the marshy island Komoran.

The shore bank with depths of less than one fathom (1^m8) over it, extends for over 6 miles from Tandjoeng Kombies and Kaap Kool.

Tidal streams.—In 1936, during the survey of Prinses Marianne straat, it was observed that between Boe eilandje (Bu islet) and

Charts 447, 2759a.

Boembel eiland (Bumbe islet), situated about 28 and 3 miles, respectively, from Tandjoeng Kombies, the tidal streams set northward from 3 hours before low water to 3 hours after low water, and set southward from 3 hours before high water to 3 hours after high water. The rate of the north-going stream was from $2\frac{1}{4}$ to $3\frac{1}{2}$ knots, and that of the south-going stream from half a knot to $1\frac{1}{4}$ knots. In the southern entrance the streams turned at the times of high and low water; at springs the south-going stream attained a rate of 3 knots and the north-going stream 4 knots.

Directions.—The following directions for Prinses Marianne straat were compiled during the survey:—

From north to south.—The northern part is easy to navigate and appears to be subject to little alteration. A mid-channel course should be steered until off the bight in approximately lat. $7^{\circ} 52' S.$ As soon as the northern shore is open, steer in on it and follow it at a distance of from about one to $1\frac{1}{2}$ cables, and when past Boe eilandje do not steer farther to port until the stretch of the opposite shore is well open.

After passing the northern entrance of Bensbach kreek follow the Komoran bank at a distance of about $2\frac{3}{4}$ cables for a distance of 2 miles, then cross over to the opposite shore and follow it at a distance of about $1\frac{1}{2}$ cables until the south-eastern point of Boembel bears 232° , when steer 219° along this point until the point situated about 2 miles northward of Kaap Kool bears 158° , when steer for it on that bearing until Tandjoeng Kombies bears 072° , when steer 146° until near the point where the direction of the coast on the south-eastern side of Komoran changes from south-south-east to south, when the bar should be crossed steering 106° .

Off the southern side of Boembel care must be taken with the south-going stream that the vessel is not set on to the extremity of the bank lying southward of this island, and the vessel should, therefore, turn on to the course 219° in good time, before the southern extremities of Boembel come open.

On the outer bar the stream sets southward when it is setting out of the southern entrance. When the drying banks southward of Boembel are entirely covered, the depths are $1\frac{1}{2}$ fathoms (3^m2) more than those charted.

From south to north.—Kaap Kool (Lat. $8^{\circ} 24' S.$, Long. $138^{\circ} 53' E.$) and Peoloe Kombies, the latter situated close off Tandjoeng Kombies, are good marks for fixing the position of a vessel on approaching the southern end of the strait; there is no difficulty in entering. During the East monsoon it is inadvisable to pass through the strait from south to north on account of the heavy sea over the shoaler parts.

In 1948, the channel in the southern entrance was on the northern side of the bank lying southward of Boembel, and the directions for entry from southward were as follows:—

Steer for a point on Komoran eiland situated about 2 miles southward of Boembel, keeping it bearing about 270° ; when Tandjoeng Kombies is abeam and the eastern coast of Boembel is seen clear of the land alter course gradually, and follow the eastern shore.

Chart 447.

SOUTHERN SIDE OF NEW GUINEA.—Coast.—The coast between Prinses Marianne straat and the boundary between the

Chart 780.

Charts 447,

Netherlands and British territory, situated about 135 miles south-eastward is low, muddy and covered with monotonous vegetation. It is fringed by a mudbank with irregular depths of less than 3 fathoms 5 (5^m5), outside which there are many shoal patches, the positions of which may best be seen on the chart.

Between Tandjoeng Kombies and Tandjoeng Kaja Kaja, a steep, wooded headland, which lies about 25 miles east-north-eastward, the coast is swampy, with mangroves behind a wide beach of sand and 10 mud, thence to the entrance to Merauke rivier, situated about 63 miles east-south-eastward, the coast consists of a low sand ridge, which lies behind a wide beach covered with trees; within are fertile plains, which are flooded during the rainy season.

There are several villages on the coast between Tandjoeng Kombies 15 and Tandjoeng Kaja Kaja. Close to the entrance to Wamal kreek, situated about 13 miles north-eastward of Tandjoeng Kombies, there is a tree which is distinctive from the offing, but on closing the coast it merges with the trees in its vicinity.

The entrance to Wamal kreek, which is very narrow has a bar which 20 almost entirely dries. It is inaccessible during the South-east monsoon. There are no villages on the creek, which is about 6 miles in length. Except with good visibility it is inadvisable for a vessel to proceed into depths of less than 3 fathoms (5^m5) between Wamal kreek and Boelaka (Bulaka) rivier, situated about 9 miles east-north-eastward. 25 There is an isolated grove of coconut trees, in the middle of which there is a large tree, situated near the mouth of Boelaka rivier.

Boelaka rivier is navigable by vessels with local knowledge with a length of 164 feet (50^m0) and a draught of about 11 feet (3^m4), as far 30 as Kampoeng Apong. About 30 miles above its mouth, in long. 139° 22' E. the river still has a width of about 90 yards (82^m3), and a depth of about 8 fathoms (14^m6). In 1914, the least depth in the approach to the entrance was one fathom (1^m8), and just inside on the bar 2½ fathoms (4^m1), increasing to 6 fathoms (11^m0) inside the river.

There is a distinctive grove of coconut trees which stands well 35 above the surrounding trees, near Kampoeng Walati, situated about 3 miles south-south-eastward of the entrance to Boelaka rivier.

About 1½ miles north-westward of Tandjoeng Kaja Kaja there is an isolated grove of trees with scrub on its western and eastern sides, and close eastward of the point is Kampoeng Welab. See view facing 40 page 267.

Off-lying islet and dangers.—The depths in the vicinity of Tandjoeng Kaja Kaja are very irregular and there are many reefs and shoals, the outermost of which are a patch which dries, about 5½ miles south-south-westward, and a 3-fathom (5^m5) patch about 6½ 45 miles south-south-eastward.

Poeloe Habeeke, which lies about 6½ miles east-south-eastward of Tandjoeng Kaja Kaja, and about 2½ miles offshore, is low but covered with high trees. It is fringed by rocks, and a sandy ledge, with a depth of 2 fathoms (3^m7) near its outer edge, extends about 1½ 50 miles westward, and forms the southern side of a narrow channel, in which there are depths of from 3½ to 4 fathoms (6^m4 to 7^m3), mud, which extends eastward along the northern side of the island; on the northern side of this channel, reefs, which dry, extend from Tandjoeng Kaja Kaja (Lat. 8° 12' S., Long. 139° 21' E.). There is always smooth

Chart 2759a.

Chart 447.

water in the channel, so landing is possible at all times on the northern side of the islet, but the channel should be marked before use.

Sametinke, a reef, lies about $1\frac{1}{4}$ miles south-south-westward of Poeloe Habeeke; on it are some reddish-brown rocks, which dry about 8 feet (2^m4). Several patches, with depths of 4 and 5 fathoms (7^m3 and 9^m1) over them, lie within $6\frac{1}{2}$ miles south-eastward of Poeloe Habeeke. A reef, which dries, with some large rocks on it, lies about $2\frac{1}{2}$ miles eastward of the islet. Farther eastward, off the mouth of Bian rivier (*see below*), the shoals consist of sand. 10

Anchorage.—Directions.—Good anchorage may be obtained by vessels with local knowledge, in a depth of $3\frac{1}{4}$ fathoms (5^m9), mud, with Poeloe Habeeke bearing 079° , distant about $2\frac{1}{4}$ miles. A vessel should approach with the islet bearing 054° , until Tandjoeng Kaja Kaja bears 315° , when she should steer 000° , which will lead to the anchorage. 15

Kampoeng Wambi, situated about 14 miles east-north-eastward of Tandjoeng Kaja Kaja, may be identified by the abrupt eastern edge of a line of remarkably tall coconut palms, which stand well above their surroundings. The mouth of Sewa rivier, situated about 2 miles north-eastward of Wambi, is only visible from south-westward and southward; it is fronted by a bar which dries, extending over half a mile offshore. Koroi rivier, entered about 8 miles farther eastward, is also fronted by a bar which dries, lying over half a mile offshore; at high water the river affords a good refuge for boats with a draught of about 3 feet (0^m9); the channel is open when bearing about 344° , 25 but it is difficult to identify.

About 2 miles westward of the mouth of Koroi rivier there is a tree, the spreading top of which projects well above the other trees in the vicinity; it can only be distinguished on a northerly bearing. A similar tree stands about 2 miles eastward of the mouth of the river; 30 the top, though less spreading, is higher, and is visible from westward and southward at a distance of 10 miles.

Bian rivier.—Bian rivier is entered about 15 miles eastward of Koroi rivier; its muddy water extends about 10 miles offshore.

In the channel over the bank leading to the mouth the depths are only about $1\frac{1}{4}$ fathoms (2^m3); on the south-eastern side of this channel about $4\frac{1}{2}$ miles outside the entrance there is the outer edge of a very steep-to sandbank, which dries. The banks near the mouth are covered with mangroves, and entirely submerge at high water. 35

There is a distinctive small grove of trees close to the western entrance point of the river, which, although not projecting high above the trees in its vicinity, can be distinguished at a distance of 14 miles. 40

A vessel should enter the river with the western entrance point bearing 061° ; if the depths decrease suddenly she should steer a more northerly course immediately; the least depth found with the small wood westward of the mouth bearing 045° . 45

The river is navigable by vessels with local knowledge of $10\frac{1}{2}$ feet (3^m2) draught, as far as Kampoeng Kabtel in lat. $7^\circ 42' S.$, long. $140^\circ 03' E.$; farther up, it narrows rapidly. Great attention should be paid to drifting timber and the tidal streams. There is practically no slack water, and, when the out-going stream is still running in the outer bend, the in-going stream may be flowing at a considerable rate into the inner bend; on one occasion the river rose 8 feet (2^m4) in 10 minutes, a rushing sound being heard. 50

Chart 2759a.

Chart 447.

Coast.—About $2\frac{1}{2}$ miles southward of the eastern entrance point of Bian rivier is Kampoeng Papis Doemandé, close to which there is a tree with a double crown, northward of which the trees on the coast become taller, and at the mouth of Bian rivier, are very noticeable. Another grove of trees is situated close south-eastward of Kampoeng Sam Doemandé, situated about 2 miles south-south-eastward of Papis Doemandé; this grove has the form of a shoe, with the toe pointing seaward, and is visible about 13 miles offshore.

10 About 5 miles farther south-eastward is a coconut grove which shows up well above the surrounding trees and is visible about 13 miles offshore, and 3 miles farther south-eastward there are two remarkable coconut trees separated by a belt covered only with scrub.

The villages of Ongari, Kaiboese and Koembe (Kumbe), situated 15 12, 16, and 18 miles, respectively, south-eastward of Sam Doemandé, and the mouth of Koembe rivier are not easy to identify at a distance, but there is a large banyan tree with a round top, standing close southward of the mouth of the river, which is visible at a considerable distance. Care must be taken, however, not to mistake the rise of 20 the edge of the forest farther southward for this tree.

Koembe rivier.—Koembe (Kumbe) rivier, entered about 23 miles south-eastward of Bian rivier, is accessible only to small vessels with local knowledge, as the channel through the coastal bank is shallow and narrow. Both banks at the entrance are overgrown with coconut 25 trees, between which and the river is a wide sandy beach. Banks, which dry, extend about 2 miles from both entrance points, and shoal patches lie farther seaward. A 2-fathom (3^m7) patch lies about 9 miles south-westward of the southern entrance point and a $2\frac{1}{2}$ -fathom (5^m0) patch lies about 6 miles south-south-westward.

30 In 1903, the approach channel trended north-eastward with a least width of about a quarter of a cable, and a depth of about $2\frac{3}{4}$ fathoms (5^m0) at high water springs. At the entrance (*Lat.* $8^\circ 22' S.$, *Long.* $140^\circ 13' E.$) the river is about $1\frac{1}{2}$ cables wide with depths increasing to 5 fathoms (9^m1). For the first 20 miles up the width varies from about 35 half a cable to one cable, with depths in the middle of from 4 to 5 fathoms (7^m3 to 9^m1), except in a few places, such as the very sharp bend just within the entrance, where the depth is about $2\frac{1}{2}$ fathoms (4^m6).

The banks are low and in its lower part, covered with mangroves; 40 higher up the timber becomes heavier, interspersed with coconut trees and bamboo, and in places there are plains overgrown with tall reeds.

Caution is necessary in proceeding through the narrow approach channel, as the current often sets across it at a rate of 2 knots, and 45 there are no marks along the coast on which to steer. During the South-east monsoon the in-going tidal stream at the mouth of the river has a rate of about $1\frac{1}{2}$ knots, and the out-going stream from 2 to 3 knots; during the North-west monsoon these rates are greater. As the river is ascended these rates diminish, but the in-going stream 50 is still felt up to Kampoeng Wayo, situated about 30 miles from the mouth in a direct line. In 1903, a steam launch proceeded up the river for about 165 miles to a point where it was only about 30 feet (9^m1) wide.

Rede Merauke.—**Dangers.**—**Lights.**—**Beacons.**—**Buoyage.**—This roadstead is situated in Merauke rivier, which flows out about 10

Chart 2759a.

Chart 447.

miles south-eastward of the entrance to Koembe rivier. A wide bank, which dries, extends about 2 miles from both sides of the entrance; through this bank there is a channel, with a least depth of about half a fathom (5^m9) in it, trending first eastward and then north-eastward, 5 to the mouth of the river.

Two shoals, each with a depth of 2 fathoms (3^m7) over it lie about 13 miles westward and west-south-westward, respectively, of Tandjoeng Haram, the eastern entrance point of the river. Breakers were reported, in 1919, about 8 miles south-westward of the same point. 10

A light-buoy, painted white and exhibiting a *white flashing* light every three seconds is moored about 7 miles south-westward of Tandjoeng Haram.

A light is exhibited, at an elevation of 75 feet (22^m9), from a white iron framework structure, 65 feet (19^m8) in height, which stands 15 about 1½ miles south-south-eastward of Tandjoeng Haram.

A light is exhibited from the head of the lower pier at Merauke.

The channel is marked by a black can buoy on the leading line.

Two leading beacons, consisting of rectangular framework structures, are situated on the northern side of the entrance to the river about 20 1½ miles northward of Tandjoeng Haram; the front beacon is 13 feet (4^m0) in height, with a white triangle, point up, and the rear beacon, north-eastward of it, is 16 feet (4^m9) in height with a white triangle, base up.

Lights are occasionally exhibited from the leading beacons. 25

Tidal streams.—From the middle of March to the middle of April the out-going stream was observed to flow for about 7 hours by the mouth of the river, at a rate of 2 knots, and the in-going stream for about 5 hours, at a rate of one knot. During November and December the stream runs in the direction of the coast, setting north-westward for 30 about 7 hours and south-eastward for about 5 hours. The in-going stream is felt for about 60 miles up the river. Off the lower pier at Merauke the stream sometimes attains a rate of 5 knots.

Anchorage.—**Directions.**—**Pilotage.**—Anchorage may be obtained by vessels with local knowledge, in a depth of about 4 fathoms (7^m3), in 35 the middle of the river, northward of the Administrator's house, where it is about a quarter of a mile wide; it is advisable to moor.

If anchoring off the copra sheds care must be taken to allow room to swing clear of the pier. The coastal bank extends for some distance from Tandjoeng Sewa (*Lat.* 8° 27' S., *Long.* 140° 22' E.), a prominent projection on the opposite side of the river. 40

Pilotage is compulsory within the limits of the roadstead; the harbour master is also the pilot.

The limits of the roadstead are, the parallel 8° 31½' S., the meridian 140° 16½' E. and the river banks. 45

A vessel approaching from westward should sound continuously when nearing Frederik Hendrik eiland and until well past Kaap Kool; thence when nearing Merauke and if too close inshore, some of the groves of trees on the coast may be distinguished. She should steer for the lighthouse, which is not easily seen owing to the dark back- 50 ground, bearing 078, thence she should steer to pass southward and eastward of the black can buoy, and then keep the leading beacons in line, bearing about 040°. When the vessel is off the northern bank of the river, she should follow it at a distance of about half a cable and as

Chart 2759a.

Chart 447.

soon as Tandjoeng Haram bears 180° she should steer a mid-channel course to the anchorage. In 1954 there was a least depth of about one fathom (1^m8) on the bar.

- 5 **Merauke rivier.**—This river is navigable by vessels of a length of about 200 feet (61^m0), and with a draught of $10\frac{1}{2}$ feet (3^m2), for a distance of 60 miles, and by boat for 150 miles. There are three bars in the lower reaches of the river above the town, with a least depth of $1\frac{3}{4}$ fathoms (3^m2) on them; elsewhere there is a general depth of about 10 5 fathoms (9^m1). For about 30 miles from the mouth the jungle becomes thicker and the width of the river gradually decreases.

Merauke.—This town, the headquarters of the Resident of Netherlands South New Guinea, stands on a low plain enclosed by forest, on the southern side of the river, about $1\frac{1}{2}$ miles eastward of Tandjoeng Haram; it is protected from flooding by a dike on the river side.

There are two piers, each about 100 feet (30^m5) in length, the lower pier is for small vessels, the upper one, which has fallen into disrepair, is situated about three-quarters of a mile above Merauke.

There is a Government doctor and hospital.

- 20 There is an airfield from which regular communication with Biak (*see* Pacific Islands Pilot, Vol. I) is possible.

If ordered in good time, by radio, a plentiful supply of meat may be obtained; fresh vegetables, fruit and fish are sometimes available in small quantities.

- 25 **Rainfall.**—*See* page 27.

Coast.—Between Merauke (*Lat.* $8^{\circ} 27' S.$, *Long.* $140^{\circ} 23' E.$) and the eastern boundary of Netherlands New Guinea, situated about 55 miles south-eastward, the coast presents an extraordinarily uniform appearance, and is fringed by a bank, with depths of less than 3 fathoms (5^m5) over it, extending about 8 miles offshore.

For description of Bensbach river and the coast eastward, *see* Australia Pilot, Vol. III.

APPENDIX I LIST OF PRINCIPAL PORTS, showing particulars of depths, etc.

PORT	Depth below Chart datum level		Rise of tide		REMARKS
	In channel of approach Fathoms	In anchorage Fathoms	Spring Feet	Neap Feet	
Tahuna baai ; Sangi	Deep	19 to 30	6.5	4.5	14 feet at head of the commercial pier
Menado ; Celebes	Deep	10 to 30	6.0	4.0	
Talisei ; Celebes	Deep	10	7.0	4.5	
Kema ; Celebes	Deep	5 to 11	4.0	3.7	
Ternate	Deep	15	4.0	2.5	30 feet alongside main wharf 24 feet alongside coaling wharf * Eastern approach 23 feet in western approach
Labuha ; Halmahera	Deep	7 to 9	—	—	
Buli ; Halmahera	Deep	5	5.0	4.0	
Baai van Sanana ; Sula eilanden	8	8	4.5	4.2	
Baai van Kajeli ; Buru	Deep	19 to 22	4.0	3.2	30 feet alongside main wharf 24 feet alongside coaling wharf * Eastern approach 23 feet in western approach
Baai van Wahai ; Ceram	Deep	22 to 27	—	—	
Baai van Amahai ; Ceram	Deep	6 to 16	—	—	
Ambon	Deep	25	5.7	4.7	
Rede Saparua ; Ambon eilanden	Deep	10 to 12	6.0	—	30 feet alongside main wharf 24 feet alongside coaling wharf * Eastern approach 23 feet in western approach
Rede Naira ; Banda eilanden	Deep*	6 to 10	7.3	—	
Rede Tual ; Kai eilanden	Deep	11 to 13	6.0	—	
Baai van Elat ; Kai eilanden	Deep	14	—	—	
Telok Solat ; Sermata eilanden	Deep	27	7.0	—	30 feet alongside main wharf 24 feet alongside coaling wharf * Eastern approach 23 feet in western approach
Rede Saumlaki ; Tanimbar eilanden	Deep	10 to 16	—	—	
Rede Ritabel ; Tanimbar eilanden	Deep	6 to 10	—	—	
Rede Saonek ; Waigeo	Deep	16	6.1	4.7	
Samate ; New Guinea	Deep	6½	—	—	30 feet alongside main wharf 24 feet alongside coaling wharf * Eastern approach 23 feet in western approach
Fak Fak ; New Guinea	Deep	25	7.3	3.8	
Etna baai ; New Guinea	Deep	6 to 10	9.8	3.1	
Merauke ; New Guinea	4 feet	4	15.8	13.0	

INDEX

	Page		Page
A, Point	58	Ake lamo, Kampung; Ake lamo	93
Light	58	baai	93
Abean, Kampung	171	Ake lamo, Kampung; Halmahera	65
Abdon eilandje	214	Anchorage	65
Aboru, Kampung	153	Ake lamo, Kampung; Kau baai	91
Aboru, Telok	153	Ake lamo, Tandjung	114
Adaut, Rede	206	Aké Selaka eilandje	91
Anchorage	206	Aké Selaka, Kampung	91
Adi eiland	252	Aké Selaka, Rede	91
Adodo, Kampung	202	Anchorage	91
Adodu, Kampung	208	Akedabo, Kampung	71
Adoca	121	Akedjodjaru, Kampung	71
Adu	70	Akimeugah rivier	266
Aduar eiland	184	Alai eiland	137
Adui eiland	61	Alang, Tandjung	149
Advilnas	172	Alfuren	60
Aentopra, Tandjung	139	Aljoei baai	214
Aer—Water, stream, <i>see</i> proper		Alon	63
name		Alusi, Kampung	209
Aer Tembago, Kampung	58	Amahai, Baai van	146
Ah	88	Dangers	146
Ahanari, Kampung	200	Light	146
Ai eiland	158	Amahai, Kampung	146
Anchorage	158	Rainfall	27
Ai eilandje	212	Amamapare, Kampoeng	265
Ai, Kampung	158	Amanmawa, Tandjoeng	261
Ai Tapor, Tandjoeng	130	Amar, Kampung	162
Aidoema eiland	258	Anchorage	162
Aidoema, Kampung	259	Amasing, Kampung	77
Aiduma eiland	258	Amat Jawah	204
Aifat, Kampoeng	240	Ambatin eilandje	75
Aika rivier	265	Ambatu eilandje	75
Ailusiha, Tandjung	146	Ambelau eiland	132
Aiputih, Tandjung	143	Ambia, Baai van	37
Air—Water, stream, <i>see</i> proper		Amboekerah rivier	266
name		Ambon, Baai van	150
Air eiland	137	Directions	151
Air Kasar, Kampung	142	Light	150
Air Tiba, Sungai	257	Ambon eiland	149
Airawoi rivier	259	S.E. side	152
Airborei eilandje	220	anchorage	152
Aiwa, Tandjoeng	258	Tidal streams	151
Ajambanna	38	W. and N. sides	149
Ajar Poetar, Kampoenga	256	anchorage	150
Ajemi eilandje	225	Ambon, Rede	150
Ajer—Water, stream, <i>see</i> proper		Anchorage	150
name		Climatic tables	33
Ajoe eiland	213	Facilities	151
Ajoe eilanden	213	Foul area	150
Anchorages	213	Lights	150
Akat eilandje	142	Radio	151
Ake lamo baai	93	Signals	151
M		Ambora, Tandjung	36

	Page		Page
Amoetoe Besar eiland	246	Asi, Tandjoeng	234
Amoetoe Ketjil eiland	246	Asia eilanden	213
Amortaun eilandje	198	Asimiro, Kampung	61
Amsterdam eiland	235	Asoeweh rivier	269
Light	235	Assan, Tandjung	162
Amsterdam fort, New	51	Asutubun eiland	209
Amutu Besar eiland	246	Atju, Tandjung	128
Amutu Ketjil eiland	246	Atnebar, Kampung	171
Anak Saudara	76	Atoeka rivier	265
Anderuwo, Tandjung	37	Atti Atti Onin, Kampoeng	249
Anger Masa eiland	206	Aturin, Tandjung	195
Anggai, Tandjung	115	Augusta eilandje	220
Anggarmasa eiland	206	Auphonia gebergte	108
Anglu, Kampung	142	Aurora bank	212
Angus Baru, Batu	57	Aweër, Kampung	208
Angus, Batu	57	Awirisi	214
Animenroe rivier	238	Awis, Tandjung	78
Anjer, Batu	82	Awoera, Tandjoeng	259
Anjur, Batu; Pisang N.W. side	118	Awu, Gunung	42
Anjur, Batu; Pisang S.E. side	118	Awura, Tandjoeng	259
Anna rivier	268	Ayar Putar, Kampoengs	256
Anyer, Batu	82		
Api, Gunung	47		
Api Api, Sungei	181	Baai = Bay, <i>see</i> proper name	163
Apibok eilandje	216	Baām eiland	163
Apiripi, Kampoeng	265	Babang baai	79
Apong, Kampoeng	274	Babang, Kampung	79
Apu, Wai	126	Babar eiland	199
Arafura sea	209	Anchorage	200
Currents	209	Shoal	200
Depths	210	Babar eilanden	198
Isolated dangers	210	Babi eiland; Kelang	134
Arago baai	217	Babi eiland; Loid, Baai van	77
Arago, Kaap	217	Babi eiland; Noesela eilanden	226
Arapua, Napu	35	Babi eiland; Piru baai	143
Aran	174	Babi eilandje; Aru eilanden	180
Aran, Tandjung	148	Babi eilandje; Weda baai	99
Arangkaā, Baai van	37	Babing eilandje	91
Anchorage	37	Babo, Kampung	246
Arar Kula	184	Babua eilandje	64
Arat, Tandjung	170	Bacham Sillum	100
Artak gebergte	4	Bachan eiland, <i>see</i> Batjan	71
Argoeni baai	255	Bachan, Straat, <i>see</i> Batjan	76
Dangers	255	Bade	270
Directions	255	Baeër eilandje	168
Argoeni eiland	242	Baguala, Baai van	152
Argoeni, Kampoeng	242	Baik, Goenoeng	248
Arnanan, Kampung	143	Bain	183
Aro Usu, Tandjung	206	Bain, Tandjung	183
Aroba, Tandjoeng	246	Bais, Karang	140
Aru eilanden	4, 176	Bajampop	122
E. side	183	Bakoi, Tandjoeng	238
N. side	177	Bakulu	61
S. side	188	Balabalak eiland	213
Tidal streams	176	Balbiléget	124
Weather	28	Balbili eiland	232
W. side	178	Light	232
Aru, Kampung	83	Balé Pasir	77
Aru, Tandjung	145	Balimaklam	140
Arus, Tandjung	54	Balimbing, Kampung	76
Light	54	Balontohe	41
Asamamanuke eilandje	133	Bam eilandje	227
Asap eiland	246	Bamana gekergte	261
Asaudi	135	Bamboe, Poelau	103
Asuadi eilandje	136	Bambung, Baai van	36
Asaudi, Kampung	136	Banda eiland, Groot	158
Asaudi, Rede	136	Banda eilanden	157
Anchorage	136	Tidal streams	157
Asbakin, Kampoeng	234		

	Page		Page
Banda, Reden	158	Batual, Tandjung	166
Tidal streams	158	Batudjungko, Kampung	132
Banda rif	189	Batugoso, Tandjung	133
Banda sea	156	Batujungko, Kampung	132
Current	19	Batula, Kampung	66
Dangers	156	Anchorage	67
Weather	28	Batumangara, Tandjung	73
Bandan Elat, Kampung	174	Batumbaranggo, Baai van	36
Bandan Eli, Kampung	176	Batunderang eiland	44
Bandera; Banda eilanden	158	Batupekat, Tandjung	130
Bandera; Morotai, Straat	86	Batutulis, Tandjung	130
Baneh eilandje	46	Baula	132
Banka eiland	54	Baun eiland	188
Bangka, Straat	53	Bawaikang, Batu	39
Dangers	54	Bawé, Kampoeng	234
Directions	56	Bawia, Tandjoeng	261
Light	54	Bé eilandje	222
Tidal streams	55	Bebalang eiland	44
Weather	55	Bebalang, Kampung	44
Bano, Sungei	122	Bebek, Tandjung	125
Bara baai	125	Bedidi, Sungei	243
Bara, Kampung	125	Bega, Tandjung	112
Bara, Tandjung	125	Begangbalo	47
Bara Sadi	204	Behang, Tandjung	46
Barakan eiland	188	Behongang, Kampung	47
Barataku, Kampung	61	Behongang, Telok	46
Barataku rotsen	61	Belang Belang baai	76
Barataku, Teluk	61	Bèlang Bèlang eiland	114
Baru, Kampung	71	Belingaratu, Tandjung	181
Batak Bual	131	Bellis Darat eiland	121
Batang Pela eiland	216	Belobo	131
Batanta eiland	223	Beludu Awu	47
Batanta rif	223	Ben eiland	238
Batavia reefs	182	Beng Darat eiland	46
Battavier rif	168	Beng Laut eilandje	46
Batbitiem eiland	124	Bengoi, Kampung	140
Batimee eiland	233	Bensbach kreek	272
Batjam Sillum	99	Bentenian eilanden	59
Batjan eiland	77	Beo eiland	213
Dangers	77	Beo, Kampung	37
Batjan eilanden	71	Beo, Rede	37
Caution	71	Anchorage	37
Tidal streams	71	Light	37
Batjan, Straat	76	Beraoe, Telok	239
Anchorage	76	Beraoer rivier	237
Beacons	76	Berawang	36
Batoe = Rock, <i>see</i> proper name		Berdaha, Kampoeng	256
Batoe eiland	123	Berri Berri, Kampung	84
Battjawat eilandje	206	Berri Berri Ketjil, Kampung	83
Batu = Rock, <i>see</i> proper name		Besar = Large, great, <i>see</i> proper name	
Batu Ampat eilanden	73	Besar eiland	137
Batu Ampat, Straat	74	Besar eilandje	126
Beacons	74	Besar, Pasir	86
Batu Dua, Tandjung	179	Besi, Baai van	138
Batu Gosoh, Tandjung	54	Besir Tandjoeng	220
Batu Gossok, Tandjung	106	Besori baai	72
Batu Itam, Tandjung	153	Besori Besar eilandje	72
Batu Kapal, Tandjung; Haruku	152	Besori Ketjil eilandje	72
Batu Kapal, Tandjung; Piru baai	143	Besori, Tandjung	72
Batu Kapitan, Tandjung	107	Bial	93
Batu Lobang, Tandjung	66	Bian rivier	275
Batu Mera, Kota	159	Biantsji Besar eilandje	216
Batu Merah, Kampung	151	Biario eiland	50
Batu Merah, Tandjung	150	Anchorage	50
Batu Nuhan, Tandjung	125	Bibi, Tandjung	73
Batu Pajong, Tandjung	158	Bibinoi	77
Batu Ra, Tandjung	76	Bicholi, Kampung	94
Batu Udang, Tandjung	158	Bidoho, Kampung	85

	Page		Page
Biltubur, Kampung	189	Bone, Tandjung	98
Bilulu, Tandjung	78	Bongo, Tandjung	88
Binaar eiland	183	Boni eilandje	218
Binaija	147	Boo	172
Bingkudu eiland	157	Boo Besar eiland	119
Bintoeni, Golf van	244	Boo eiland	124
Head of	247	Boo eilanden	119
N. shore	244	Boo Ketjil eiland	119
S. shore	245	Booi	154
Tidal streams	244	Booi, Tandjung	153
Birab, Kampoeng	269	Borang, Tandjung	173
Biroefoe, Kampoeng	269	Bosche, Kaap van den	247, 251
Bisa eiland	113	Botu, Tandjung	110
Bisoa, Tandjung	60	Bougainville, Straat	213
Bitjoli, Kampung	94	Bowondeke eiland	47
Bitsjara baai	257	Bowoné	41
Bitsjara, Kampoeng	257	Brazza rivier	269
Bitsjara, Tandjoeng	256	Bu islet	272
Bitung, Kampung	58	Buaja gebergte	108
Black rock	82	Bualo, Tandjung	36
Blackburn bank	183	Buang eiland	41
Blackwood shoal	17, 210	Buar eiland	178
Bloemen rivier	265	Budd eilandje	214
Bo eilanden	119	Bufflehoorn	214
Boano eiland	134	Buhias, Kampung; Pahepa	48
Dangers	134	Buhias, Kampung; Tahulandang	50
Anchorage	134	Buhias, Rede	49
Tidal streams	135	Anchorage	50
Bobale eiland	90	Light	49
Bobale, Kampung	90	Buhiase, Tandjung	44
Anchorage	90	Bui eilandje	165
Bobane baai	91	Bui Tandjung	153
Anchorage	91	Bukide	50
Bobane Huda, Tandjung	115	Bukide eiland	41
Bobané Igu, Kampung	91	Bukide eilandje	43
Bobo baai	72	Buku, Tandjung	69
Bobo, Tandjung; Ceram	140	Buku Amasing	77
Bobo, Tandjung; Halmahera	62	Buku Gaku	75
Bobolo	92	Buku Gaku, Tandjung	75
Bobolo baai	92	Buku Indari	73
Anchorage	92	Buku Kabau	72
Boboro, Tandjung	84	Bula	140
Bobot, Wai	147	Bula baai	141
Bocht = Bay, <i>see</i> proper name		Anchorage	141
Bodo eilandje	226	Light	141
Boe eilandje	272	Oil fields	141
Boelaka rivier	274	Bula, Kampung	141
Boembel eiland	273	Facilities	141
Boemfoar	119	Bulaka rivier	274
Boenoha, Kampoeng	241	Buli baai	93
Boeroe gebergte	262	Anchorages	94
Boeroe rivier	263	Current	95
Bohia	260	Dangers	93
Bohia, Tandjoeng	252, 260	Tidal streams	95
Bohoi, Tandjung	54	Buli, Kampung; Buli baai	93
Bokamau rivier	264	Buli Kampung; Taneti	71
Boki Nanasi	102	Buli, Rede	94
Boleh Madjiko, Teluk	80	Beacons	94
Anchorage	80	Directions	94
Boleo, Tandjung	90	Bumbe islet	273
Bolifar, Tandjung	141	Bunakeng eiland	53
Bolke eilandje	232	Bunakeng, Tandjung	42
Light	232	Bunga Radja, Ajer	182
Bolontohe, Batu	48	Bunoha, Kampoeng	241
Bolu eilandje	203	Buntal eilandje	135
Bombédari eilandje	218	Buobè, Tandjung	78
Bomberai, Sungei	243	Buoyage	6
Bomjai	221	Burang, Tandjung	158

	Page		Page
Buru eiland	124	Dabo baai	93
Climate	124	Dabu, Labuan	175
E. side	132	Dadang	163
anchorages	132	Dadi, Tandjoeng	224
tidal streams	132	Dagasuli eiland	60
N. side	125	Dago, Baai van	43
anchorages	126	Dago, Kampung	43
S. side	128	Dai eiland	201
anchorages	128	Dajang eiland	224
off-lying dangers	128	Dajoang eilandje	75
tidal streams	131	Dakupang eilandje	43
Weather	25	Dama, Kampung	60
W. side	127	Anchorage	60
anchorages	127	Damar eiland; Obi, Straat	82
tidal streams	127	Damar eiland; Sermata eilanden	192
Buru gebergte	262	Anchorage	192
Buru rivier	263	Damar eilanden	192
Busu Busu, Kampung	84	Damar, Pulu	64
Busua, Kampung	72	Damoli	93
Buwu, Tandjung	43	Dampier, Straat	218
Buya mountains	108	Directions	223
		Islands and dangers	219
		Tidal streams	219
Camphuys eiland	220	Danama, Tandjung	142
Canton Packet	95	Dane eilandje	46
Carstensz Toppen	4, 263	Dangar	29
Cecilia gebergte	136	Daram eiland	122
Celebes	2	Anchorage	122
N.E. end	50	Darembang, Kampoeng	243
Ceram	134	Datu rif	168
E. side	140	Davoer rivier	238
anchorages	140, 142	Daweloor eiland	200
tidal streams	142	Dawera eiland	200
Islands off S.E. end	160	Dawora eiland	76
tidal streams	160	De Jong's bank	267
N. side	136	De Jong's punt	269
anchorages	137	Deem	213
tidal streams	136, 140	Deer eilandje	120
S. side	143	Deer, Kampoeng	120
tidal streams	144	Degen rivier	241
Weather	25	Dehekolano, Tandjung	111
W. side	134	Deherete eilandjes	60
anchorages	135	Deket, Nusa; Loid, Baai van	77
Ceram Laut eiland	161	Deket, Nusa; Obit group	76
Ceram Rei eilandje	161	Delphine eilandje	217
Ceram sea	105	Deratisation	5
Weather	25	Derdi eilandjes	252
Ceram, Straat	145	Deréhi, Tandjung	182
Chapali eilandje	83	Digoel pier	160
Chapalulu, Kampung	110	Digoel rivier	269
Charles Louis gebergte	263	Caution	269
Chauraga	62	Directions	271
Chef eilandje	94	Tidal streams	271
Cher bank, Le	17, 210	Diti, Pulu	61
Chio, Kampung	83	Djabu, Pulu	78
Chukor	72	Djailolo	64
Climate and Weather	20	Djailolo, Baai van	64
Climatic tables	33, 34	Djailolo eilandje	120
Cocq d'Armandville rivier, Le	267	Djailolo, Kampung	64
Communications	5	Djailolo passage	96
Cook rivier	269	Tidal streams	96
Coquille eilandje	212	Djal eilanden	124
Currency	4	Djam eilanden	124
Currents	17	Djarang eilandje	187
		Djawallan, Kampung	196
Daab	172	Djedan eilanden	178
Dabatan, Tandjung	124	Djeh eilandje	189
		Djere, Tandjung	74
		Djerief eiland	220

	Page		Page
Djerum, Pulu	113	Drie Gebruders eilanden	166
Djerusu, Kampung	191	Drietopberg	172
Djeudin eiland	189	Drijvers eiland	99
Djiko Dollong	115	Dromedaris, Groote	136
Djiko Gusung Guku	114	Dromedaris, Kleine	136
Djiko Kahiamasolo	111	Druvig eiland	99
Djika Loleopapa	111	Du Rowa eiland	168
Djiko Sago	54	Du Rowa, Straat	168
Djiku Merasa	126	Approaches	168
Djin eilanden	188	Beacons	168
Islands and dangers S. of	189	Dangers	168
Djiré, Pulu	70	Tidal streams	168
Djobubu, Tandjung	116	Dua, Batu	152
Djodjefa, Tandjung	85	Dua, Pulu	57
Djodji eilandje; Pajahi, Baai van	65	Dua Seta	62
Djodji eilandje; Weda baai	99	Duata	36
Djodjok eiland	72	Duddell shoal	17
Djodlo, Kampong	224	Dufa Dufa	72
Djoe	216	Dufin eilandje	175
Djoronga eiland	81	Dufuk	66
Djuha eilandje	192	Duiveneiland	220
Djursian eiland	185	Duko, Tandjung	62
Djursian group	185	Dukono	88
Djursian, Kampung	185	Dukono, Valsche	88
Doan, Tandjung	172	Dulah, Kampung	169
Dobegasi, Tandjung	65	Dumarche eiland	40
Dobo, Kampung	180	Dumas rivier	267
Dobo, Rede	179	Dusborgh rif	195
Anchorage	180	Dwars in den Weg eiland	242
Beacon	180		
Buoy	180		
Directions	180		
Lights	179	East summit	90
Tidal streams	180	Eastern Archipelago	1
Dodah, Tandjung	42	History	1
Dodinga baai	64	Inhabitants	2
Anchorage	65	Ederah rivier	270
Beacon	65	Ef Kasja eilandjes	122
Dangers	65	Ef Pian eilandjes	122
Dodinga, Kampung	64	Ef Torobi eiland	120
Dododa hohé	87	Efruan, Nuhu	167
Dodoku eilandje	109	Egeron reef	249
Dodola Besar eilandje	86	Egeron, Straat	205
Dodola Ketjil eilandje	86	Ehise	40
Doea eilanden	226	Eiland = Island, <i>see</i> proper name	
Doeflah, Kampung	169	Eilanden rivier	265, 268
Dofa, Baai van	106	Eilandje = Islet, <i>see</i> proper name	
Doi eiland	60	Ekka eiland	249
Dojiaissi rivier	269	Ekor, Kampung	91
Dolong, Nusa	37	Ela eilandje	149
Domoro ma doto, Tandjung	81	Ela, Wai	137
Dona Carmalita	119	Elat, Baai van	174
Doodkist	55	Anchorage	174
Doom eiland	228	Beacons	174
Light	228	Dangers	174
Radio station	230	Directions	174
Dopier eilandje	228	Elat, Kampung	174
Light	228	Elban	123
Dorapedo	77	Ellel eilandje	185
Doré, Tandjung	234	Elmos, Karang	100
Doré Hoem baai	234	Elmoos, Karang	100
Anchorage	234	Elpaputih baai	145
Dorlau eilandje	186	Anchorage	146
Dosi, Sungei	181	Emborra rivier	261
Dowongi Kokotu, Kampung	86	Emma Top	263
Dowora eilanden	81	Ender rif	167
Dowora Itji eiland	81	Entrecasteaux, Kaap D'	215
Dowora Lamo eiland	81	Enu eiland	189
Dramai eiland	259	Epar eilandje	188

	Page		Page
Er eilandje	168	Fogi, Kampung	127
Essang, Baai van	36	Anchorage	127
Anchorage	36	Fogi, Pulu	127
Essang, Kampung	36	Foja, Kampung	99
Essang, Sungei	36	Foja, Rede	99
Etaboeri, Tandjung	260	Anchorage	100
Etang, Karang	47	Dangers	100
Etna baai	261	Foja, Tandjung	99
Anchorage	262	Fokalik, Kampung	112
Dangers	261	Foni	93
Directions	262	Fordate eiland	208
Tidal streams	262	Forrest, Hoek	217
Eugénie eilandje	217	Foya, Tandjung	99
Evanas, Tandjoeng	223	Franklin shoal	17, 210
Evans shoal	17, 210	Frederik Hendrik eiland	272
		Frinun eilandje	202
		Friwin eilandje	220
		Friwinbonda eilandje	220
		Fuel	5
		Fwojo eilandje	216
Fadol eiland	166		
Fafanlap, Kampoeng	124	Gaah, Teluk	101
Fagoe rivier	237	Gafi eiland	70
Fagoe genan	123	Gafi Kampung	71
Fair eiland	169	Gag eiland	103
Fak Fak, Kampoeng	250	Dangers	103
Fak Fak, Rede	249	Gag eilandje	124
Anchorage	249	Gakkutu eilandje	70
Approaches	249	Galela, Bocht van	87
Beacon	249	Anchorage	88
Dangers	249	Galela, Kampung	88
Directions	249	Galela, Rede	88
Light	249	Anchorage	88
Fak Fak, Sungei	250	Galo Galo Besar eilandje	86
Beacons	250	Galo Galo Ketjil eilandje	86
Fakoi	172	Gam eiland	220
Falabisahaja, Tandjung	109	Gam Konora	63
Fam eiland	219	Gam Konora, Sungei	63
Fam eiland, Groot	219	Gam ma gugu, Kampung	79
Fanadjuring, Tandjung	180	Anchorage	79
Fanajuring, Tandjung	180	Gam Tofkange, Kampung	69
Fani eiland	213	Anchorage	69
Fanum, El	96	Gamjaha	75
Faoer eiland	250	Gamlaha, Kampung	90
Fargata, Tandjung	109	Gamme Lamo, Gat van	68, 69
Farnusan eilandje	202, 207	Gamsungi, Rede	97
Fat Eli	140	Gamudja, Pulu	79
Fatagar, Tandjoeng	240	Gane, Baai van	79
Faternoes eiland	256	Anchorage	79
Fatparoma, Tandjung	112	Gane di dalam, Kampung	79
Fatsati, Pulu	109	Gané di luar, Kampung	99
Fatu Kapal	132	Gangga eiland	54
Fatudjuring, Tandjung	180	Gangroerimoer, Tandjoeng	248
Fatufat, Tandjung	128	Ganoné eilandje	82
Fatujuring, Tandjung	180	Gareel riffer	93
Fatukombu, Tandjung	106	Garung Garung baai	75
Fatupira, Tandjung	109	Gat = Channel, <i>see</i> proper name	
Faturei, Tandjung	182	Gébé eiland	96
Fau eilandje	102	Gebergte = Mountain range, <i>see</i> proper name	
Tidal streams	102	Gebroken eilanden	225
Faur eiland	250	Geelmuiden eilandje, Groot	81
Fenjuring eilandjes	189	Geelmuiden eilandje, Klein	82
Fer, Kampung	173	Geelvink baai	4
Ferai, Tandjoeng	259	Gelanit	167
Féraun, Sungei	181	Gelanit, Bocht van	169
Fet Dom, Tandjoeng	121	Gemeene hoek	271
Fitzmaurice shoal	121		
Five islands	81		
Flamingo baai	267		
Flinders shoal	17, 210		
Fofak baai	217		
Anchorage	217		

	Page		Page
Gemia, Kampung	96	Gurua Boso	79
Anchorage	96	Anchorage	79
Gemien eiland	216	Guruapin, Kampung	70
Genofo	255	Guruapin, Rede	70
Geser eilandje	161	Anchorage	70
Light	161	Guruapin, Tandjung	70
Geser, Kampung	161		
Geser, Rede	161		
Anchorage	161		
Directions	161		
Geta eilandjes	116	Haas, Kampung	49
Geti, Kampung	77	Habee Amman eilandje	272
Gila, Tandjung	85	Habee Sillam eilandje	272
Gilitopa, Kampung	88	Habeeke, Poeloe	274
Giliwolo rivier	237	Anchorage	275
Gina, Tandjung	106	Haga ma doto eilandje	117
Ginjamato eilandje	124	Haitlal eilandje	121
Girian, Kampung	58	Haja, Tandjung	134
Gita, Kampung	65	Hajasa, Rede	133
Anchorage	65	Hakuluane, Tandjung	133
Glop Mellopo, Karang	100	Halmahera eiland	60
Godji kreek	84	Climate	60
Godon eilandje	168	E. side	87
Goëba	96	climate	87
Goede Hoop, Kaap de	234	W. side	61
Goenoeng = Mountain, <i>see</i> proper		anchorages	61
name		Halmahera sea	92
Gofa, Pulu	148	Anchorage	93
Gogosoma	78	Current	19
Gohadjodjara, Tandjung	111	Dangers	93
Goja uku	87	Haluaumuna, Tandjung	153
Gojang, Batu	183	Hanua, Tandjung	137
Goji, Kali	84	Haokep, Tandjoeng	121
Goldjuring, Tandjung	189	Haowat eilandje	121
Golf = Gulf, <i>see</i> proper name		Hapale, Tandjung	133
Goljuring, Tandjung	189	Hapo, Kampung	83
Gomo, Kampung	72	Haram, Tandjoeng	277
Gomumu, Pulu	117	Haria, Baai van	154
Goraichi islands	70	Haruku eiland	153
Goraitji eilanden	70	Anchorage	153
Anchorage	71	Haruku, Kampung	152
Dangers	70	Haruku, Straat	152
Gorango, Tandjung; Halmahera	88	Anchorage	152
Gorango, Tandjung; Morotai	83	Hasselt eiland	81
Goras, Kampeong	243	Hatala eilandje	149
Goras, Tandjoeng	240, 243	Hatawanu, Tandjung	125
Goro Goro	77	Hatiari, Tandjung	152
Gorolama eiland	61	Hatiling, Baai van	139
Gorong eiland	162	Dangers	139
Gorong eilanden	162	Hatiling, Kampung	139
Anchorage	162	Hatu Alang, Tandjung	134
Tidal streams	162	Hatu Mani	146
Goya uku	87	Hatu Supun, Tandjung	138
Great Muras rivier	266	Hatualane, Tandjung	154
Griffin reef	195	Hatuluta, Tandjung	136
Groot Moeras rivier	266	Hatumeten, Tandjung	145
Guai, Tandjung	64	Haturusun, Tandjung	145
Gulalo, Tandjung	64	Hatusua, Kampung	145
Guli Guli, Kampung	149	Hatuwn, Kampung	139
Gumela, Tandjung	66	Haumua	147
Gumorga eiland	70	Haya, Tandjung	134
Gumutu eiland	82	Hebri, Tandjung	173
Gunatin	48	Heilige straat	233
Gunung = Mountain, <i>see</i> proper		Hellwig rivier	265, 267
name		Henaputih, Tandjung	135
Gunung Api eiland	159	Henhuhui	143
Gurama, Tandjung	60	Heniaar eiland	166
Guratu eilandje	65	Herberg eilandje	74
Gureda eilandje	60	Herberg Straat	74

	Page		Page
Herlei, Rede	199	Intata eiland	35
Anchorage	199	Ipah, Pasi	107
Hesketh shoal	226	Ipoekwa rivier	266
Hewal, Tandjung	138	Irimawa rivier	255
Hila, Kampung	191	Iris, Straat	258
Hila, Tandjung	150	Anchorage	259
Hiri eiland	67	Itain eiland	202
Anchorage	67	Itéwi, Tandjoeng	261
Hitu, Schiereiland	149		
Hitu Lama, Kampung	150	Jaan, Nuhu	174
Hoa eilandje	171	Jaco eiland	190
Hoalmoal, Schiereiland	135	Jaco, Straat	190
Hoar, Tandjung	172	Jadata	123
Hoek=Cape, point, <i>see</i> proper		Jaganan eilandje	124
name		Jahadiang, Kampoeng	239
Hoem eiland	234	Jailolo	64
Hoh baai	175	Jailolo bay	64
Hoiko, Kampung	175	Jailolo passage	96
Hollat, Kampung	176	Jakati, Sungei	247
Hor, Kampung	173	Jamdena eiland	201
Horiel	149	E. side	207
Horot domi, straat	163	dangers off	208
Hoti, Kampung	140	directions	209
Hufau, Tandjung	72	Islands N. of	201
Huhula	143	W. side	202
Huisman rif	167	Jamdena, Straat	203
Hulaliu, Kampung	153	Anchorage	204
Hulung, Tandjung	150	Caution	203
Hunter bank	212	Dangers	204
Huruano	153	Tidal streams	204
Hururu, Kampung	146	Jamoersba, Tandjoeng	235
Hutumuri, Kampung	152	Jamtil, Kampung; Heniaar	167
Hutumuri, Tandjung	152	Jamtil, Kampung; Nuhu Tjut	176
Huwe	149	Jamtoc, Tandjoeng	120
		Jamtoep, Tandjoeng	236
Ibu	62	Janboeda, Kampoeng	220
Ibu, Sungei	62	Jantimur, Kampung	176
Anchorage	63	Japakopare, Kampoeng	263
Idenburg Top	263	Japakopare rivier	263
Idimafola, Tangjung	72	Japale eiland	124
Iga	92	Japbari, Karang	260
Iga, Kampung	92	Jar eiland	219
Anchorage	92	Jaramabonga, Tandjoeng	261
Igi eiland	213	Jarang eilandje	187
Iha, Kampung	144	Jarleier, Tandjung	173
Ikaguri eilandje	184	Jarngur Raa	205
Ilal, Kampung	132	Jarngur Rual	205
Ili, Tandjung	125	Jatoke, Kampung	200
Ilila, Kampung	164	Java baai	258
Ilmamui eiland	185	Java reef	179
Ilmarang, Kampung	201	Jeben eilandje	216
Anchorage	201	Jedan islands	178
Ilor, Tandjung	140, 142	Jef eiland	100
Imbikwan, Tandjoeng	221	Jef Beto eilandje	119
Imbu Imbu baai	72	Jef Bie eilandje	123
Inaboeka rivier	266	Jef Danja eilandje	225
Indawiwi baai	75	Jef Doif eilandje	224
Indonesia, Republic of	1	Jef Doif eilanden	103
Ingalan	103	Dangers	103
Ingar eiland	163	Jef Fam eilanden	219
Ingelas baai	141	Jef Jal eilandje	237
Anchorage	141	Jef Joes eilandje	236
Inggeland, Kampung	94	Light	236
Inggeland, Pulu	94	Jef Kaboe eilandje	216
Inggeland, Tandjung	93	Jef Kanjin eilandje	121
Inggivakke rivier	271	Jef Kasim eiland	227, 231
Inis	41	Anchorage	231

	Page		Page
Jef Matel eilandje	237	Kaiawat rivier	222
Jef Mo eiland	233	Kaibobo, Kampung	26
Jef Nanas eilandje	232	Kaiboese baai	238
Jef Pelee eiland	123	Kaiboese rivier	238
Jef Tsiep eilandje	216	Kaiboese, Kampoeng	276
Jefman eiland	227	Kailakat, Rede	163
Jeh eilandje	179	Anchorage	163
Jembro, Kampung	166	Kailolo, Kampung	152
Jennanas, Tandjoeng	220	Kailupa, Tandjung	64
Jera rivier	263	Kaimana baai	256
Jere, Tandjung	74	Kaimana, Kampoeng	257
Jerum, Pulu	113	Kaimana, Rede	257
Jerusu, Kampung	191	Light	257
Jeudin eiland	189	Kaimeer eiland	164
Jiew eilandje	95	Kaimeer groups	164
Light	95	Anchorage	165
Reef E. of	95, 212	Dangers	165
Volcanic disturbance	95	Kaimeer, Kampung	165
Jiko Dollong	115	Kaioeni rivier	242
Jiku Merasa	126	Kairatu, Kampung	145
Jilloe eilandje	124	Kais rivier	239
Jin islands	188	Kaitero, Sungei	246
Jobubu, Tandjung	116	Kaiuni rivier	242
Joe eilandje	123	Kaiwatu, Kampung	197
Joese Genan eiland	236	Kaja Kaja, Tandjoeng	274
Joefa, Tandjung	85	Kajeli, Baai van	126
Joji eilandje; Pajahi, Baai van	65	Anchorage	126
Joji eilandje; Weda baai	99	Rainfall	27
Jojob baai	75	Kajoa eiland	69
Jolly eiland	37	Kajoe Merah baai	259
Jong's bank, De	267	Kajoe Merah eiland	259
Jong's punt, De	269	Kajuputih, Tandjung	132
Ju eiland	103	Kak Remat	132
Anchorage	103	Kakaro lamo eiland	89
Juliana Top	263	Kakarutan eiland	36
Jursian group	185	Kakmela, Tandjoeng	238
		Kala Huhun	133
		Kalabat	57
		Kalama eiland	46
		Kalapa eilandje	198
Kaap = Cape, <i>see</i> proper name		Kalasei, Tandjung	50
Kaar	172	Kalasuga, Kampung	42
Kabarei baai	218	Kalawai, Tandjung	137
Kabarisi, Tandjoeng	245	Kalbur eilandje	202
Kabat Ha, Tandjung	129	Kaledoko, Tandjoeng	236
Kabat Roit, Tandjung	129	Kalehangeng, Tandjung	42
Kabau, Kampung; Haruku, Straat	152	Kali = River, <i>see</i> proper name	
Anchorage	153	Kalies eilanden	121
Kabau, Kampung; Sanana	112	Kalinaon eilandje	56
Kabau, Tandjung	110	Kalinda, Kampung	43
Kabawa eilandje	203	Kalongan, Kampung	38
Kaboe eilanden	225	Anchorage	38
Kaboei baai	221	Kaluwatu, Kampung	43
Kaboei, Straat	221	Kama, Kampung	36
Kabra eiland	233	Kamarin rivier	244
Kabra Bemoek eiland	233	Kambelangan rivier	260
Kabtel, Kampoeng	275	Kamjolo, Tandjoeng	226
Kaburuang eiland	39	Kamoeai eiland	226
Anchorage	39	Kamoomjel eiland	231
Kaburuang, Straat	39	Light	231
Dangers	39	Kampoeng = Village, <i>see</i> proper name	
Kadera, Pulu	115	Kampoeng rivier	269
Kadola eiland	167	Kampung = Village, <i>see</i> proper name	
Kahakitang eiland	46	Kamrau baai	254
Kahatola eiland	61	Approaches	254
Kaheri eilandje	123	Dangers	254
Kai eilanden	3, 164	Kanaka, Kampoeng	254
Weather	28		
Kai Dulah eiland	167		
Kai Tanimbar eiland	171		

	Page		Page
Kanari eiland	121	Kau baai— <i>cont.</i>	
Kandorwa, Tandjoeng	224	Outer part	90
Kangurma, Sungei	187	anchorages	90
Kanobé eilandje	214	Kau Kampung	90
Kanoenoet Sollow	123	Kau, Rede	91
Kapal	151	Kau rivier	91
Kapal, Batu; Aru eilanden	186	Kaurangka eiland	157
Kapal, Batu; Banda, Groot	158	Kausigi, Tandjung	110
Kapal, Batu; Bangka	54	Kawa, Kampung	135
Kapal, Batu; Haruku, Straat	152	Kawalusu eiland	40
Kapal, Batu; Leksula baai	129	Kawar Noewa eilandje	250
Kapal, Batu; Lambeh	57	Kawar Nuwa eilandje	250
Kapal ma loleo, Teluk	79	Kawarga rivier	269
Kapalatmada	125	Kawassi, Tandjung	114
Kapat Malesket, Tandjung	123	Kawé eiland	213
Kaporo, Kampung	109	Kawio eiland	39
Kaptjan Ketjil, eilandje	121	Kawio eilanden	39
Kapuliha eilandje	48	Anchorage	39
Karabra rivier	237	Current	41
Karaka	247	Kawus, Tandjung	178
Karaka, Tandjoeng	240	Kayeli, Baai van	126
Karakelong eiland	36	Kayoa eiland	69
Anchorage	36	Kayu Merah baai	259
Karakitang eilanden	46	Kayu Merah, Tandjung	67
Anchorage	46, 47	Kayuputih, Tandjung	132
Karambuku	65	Keakwa, Baai van	264
Karang=Coral reef, <i>see</i> proper name		Keakwa, Kampoeng	264
Karang eiland	189	Keakwa rivier	264
Karas eiland	250	Kedafota, Tandjung	109
Karata eilandje	203	Keebke riki rivier	270
Karatung eiland	35	Kefing, Straat	161
Karatung, Kampung	35	Dangers	161
Karawatoe eiland	253	Kéké	249
Karaweira eilanden	185	Kekeh Besar eiland	195
Karaweira, Groot	186	Kekeh Ketjil eiland	195
Karaweira Mariri	185	Kekek eiland	117
Karaweira Watulei	185	Kelakais rivier	238
Karbau, Tandjung	126	Kelang eiland	133
Karim eilandje	230	Anchorage	133
Karok, Pasir	75	Directions	134
Karoefa rivier	254	Kelang, Straat	133
Karokaro, Tandjung	65	Tidal streams	134
Karufa rivier	254	Keli Badir	140
Karwai eilandje	190	Keli Dukun	140
Kasa eilandje	143	Keliatunu, Tandjung	194
Kasbi, Tandjoeng	235	Keliwala eiland	253
Kasiem eiland	233	Keljobar Wahan	201
Kasim, Kampoeng	227	Kelo, Pulu	116
Kasira, Sungei	246	Kema, Kampung	59
Kasiruta eiland	72	Kema, Rede	59
Anchorage	72	Anchorage	59
Kasiui eiland	163	Light	59
Kasoeri, Sungei	246	Rainfall	27
Kasteel eiland	266	Kemboling eiland	39
Kasteel rivier	266	Anchorage	40
Kasteelberg	90	Kembono, Tandjung	45
Katapatjan	227	Kemoedan rivier	240
Katapoe	121	Kemudan rivier	240
Katéra rivier	263	Kena eilandje	107
Katherine islet	95	Kerai	146
Katinai Besar eilandje	82	Kerka, Pulu	115
Katinai Ketjil eilandje	82	Keroeo eilandje	219
Katjepi, Kampung	102	Keroepiar	220
Katjuwawa eiland	86	Keswu eiland	204
Kau baai	64, 90	Ketimkerio eiland	124
Directions	92	Ketjil=Small, <i>see</i> proper name	
Inner part	91	Ketjil eilandje	126
anchorage	91	Ketjil, Pulu	128
		Ketjitet eilandje	123

	Page		Page
Ki, Tandjung	188	Komano, Sungei	245
Kia rivier	270	Kombies, Poeloe	273
Kiama, Kampung	38	Kombies, Tandjoeng	273
Kida, Tandjung	71	Komfane, Kampung	184
Kie Matubu	64, 68	Komfane, Tandjung	184
Kifar eilandje	160	Kommerrust eilandje	104
Kilbad, Kampung	142	Komo	62
Kilgah, Kampung	142	Komorani eiland	273
Kilmui, Kampung	142	Konan eilandje	184
Kilmuri, Rede	148	Konda, Kampoeng	238
Kilmuri, Tandjung	148	Koningin Sophia, Straat	257
Kilun, Kampung	202	Anchorages	258
Kilwaer, Kampung	176	Kool, Kaap	272
Kilwaru eiland	161	Koon eiland	160
Kilwaru, Straat	161	Kootbaai eilandje	184
Beacons	161	Kopeng Watu, Tandjung	142
Light	161	Kor, Sungei	235
Tidal streams	161	Kora Kora baai	53
Kima, Kampung	52	Kore eilandje	209
Kinabahutan eiland	56	Korlé eilandje	185
Kirana, Tandjoeng	250	Koro eiland	109
Kisalaut, Kampung	148	Koroi rivier	275
Kisalaut, Rede	148	Korrier rif	56
Anchorage	148	Kosah baai	75
Kisalaut, Tandjung	148	Kota Batu Merah	159
Kisar eiland	195	Kotania, Baai van	135
Kisi, Tandjung	147	Anchorage	135
Kital eiland	192	Kotania, Kampung	135
Kjabrengan	202	Koté	244
Klaarbeak eiland	103	Kotta, Ajer	193
Klarbek eiland	103	Kotta, Kampung	69
Klasi eilandje	130	Anchorage	69
Klein eilandje	265, 267	Kovo, Kampung	69
Klein, Kleine=Little, <i>see</i> proper name		Anchorage	69
Kliplip Watu	178	Kovo, Tandjung	69
Klis, Kampung	197	Kowika eilandje	258
Kobalin eiland	237	Krad eilandje	174
Kobroör eiland	176	Kraka eilandje	158
Koemawa	248	Kramram, Tandjoeng	241
Koembe, Kampoeng	276	Krei, Kampung, Nieuw	189
Koembe rivier	276	Krei, Kampung, Oud	189
Koemoera, Tandjoeng	258	Kri eiland	220
Koepelberg	122	Krok	242
Koepora Poekwa rivier	265	Kronkel rivier	269
Kofiau eiland	119	Krus eilandje	168
Anchorages	120	Kuako, Tandjung	145
Kogotea	197	Kubi eilandje	82
Koh eiland	220	Kubu, Batu	92
Kokas, Kampoeng	239, 242	Kukupang, Kampung	82
Kokas, Rede	242	Kukusan	132
Anchorage	242	Kulefu eiland	100
Light	242	Kuli	197
Kokka, Baai van	98	Kultubai-Noord eilandjes	188
Anchorage	98	Kultubai-Zuid eiland	188
Dangers	98	Kulur, Baai van	45
Kokoja eiland	86	Anchorage	45
Kokomoruku	87	Kulur eiland	183
Kokonao, Kampoeng	264	Kulur, Kampung	45
Kokraaf, Tandjoeng	248	Kuma, Tandjung	112
Köl, Cape	272	Kuma, Wai	128
Kola eiland	176, 183	Kumbe, Kampoeng	276
Kola Watu	178	Kumbe rivier	276
Kolff bank	272	Kumnaar eilandje	189
Kolff, Kaap	272	Kumu eiland	89
Kolff rivier	269	Kumul eiland	185
Kolo eilanden	100	Kumul, Kampung	185
Kolorai eiland; Morotai	86	Kumur, Kampung	193
Kolorai eiland; Tobelo eilanden	89	Kumura, Tandjoeng	258
		Kupera Pukwa rivier	265

	Page		Page
Kur eiland	165	Laoezaro eiland	258
Kurier	114	Lapan baai	79
Kurkap eiland	163	Anchorage	79
Kusu eilanden	78	Lapango, Kampung	43
Kusu Ma Doro	78	Lapi, Kampung	85
Kutbaai eilandje	184	Laponda eiland	157
		Larat eiland	207
		Larat, Tandjung	174
		Lari	159
Laag eiland	265, 267	Lasi rif	137
Laba eilandje	60	Lata Lata eilanden	71
Laboean = Anchorage, <i>see</i> proper name		Anchorage	72
Laboechan = Anchorage, <i>see</i> proper name		Off-lying danger	72
Labuan = Anchorage, <i>see</i> proper name		Latal, Telok	145
Labuan Compénie, Tandjung	58	Latu, Tandjung	145
Light	58	Laut	192
Labuba, Rede	76	Laut, Nusa	155
Anchorage	77	Anchorage	155
Lights	77	Lawak eiland	218
Labuhan = Anchorage, <i>see</i> proper name		Lawakano	155
Laehari, Kampung	152	Laweang eilandje	49
Laelaemaar, Sungei	189	Lawin eiland	118
Laer Majoran, Tandjung	174	Lawin eilanden	117
Lafusa eiland	178	Le Cher bank	17, 210
Laibobar eiland	203	Le Cocq d'Armandville rivier	267
Anchorage	203	Lebessan peninsula	44
Laigoma eiland	70	Leer eilandje	187
Lailawan eilandje	198	Leeuwarden rif	140
Lain eilandje	149	Lefau, Tandjung	84
Laitimor, Schiereiland	149	Legli, Karang	97
Laitot eilandje	121	Lehaga eilandje	54
Laiwui, Kampung	115	Lehe, Tandjung	45
Laiwui, Rede	115	Leitin, Tandjung	183
Anchorage	115	Leksula baai	129
Dangers	115	Anchorage	129
Laiwui rif	115	Danger	129
Lajar, Batoe	243	Directions	129
Lajar, Batu	243	Light	129
Lajoni, Kampung	193	Outlying shoals	129
Anchorage	193	Leksula, Kampung	129
Lakahia, Bocht van	260	Lelai, Tandjung	92
Anchorage	260	Lelamtuti eiland	188
Buoy	260	Lelang, Baai van	199
Directions	260	Lelar, Tandjung	182
Lakahia eiland	260	Lélédé	217
Lakor eiland	198	Leleo Basso, Tandjung	114
Lakor, Straat	197	Leleve	94
Tidal streams	197	Leliling eilandje	187
Lalansoai, Tandjung	135	Lelingluan, Kampung	208
Lalawang, Tandjung	38	Lem Lem, Takat	66
Laliolo eiland	118	Lembeh eiland	57
Lalola, Tandjung	133	Light	57
Laluhe, Kampung	35	Lembeh, Straat	57
Laluin eiland	70	Anchorage	58, 59
Lama, Tandjung	139	Buoys	58
Lamakika, Tandjung	138	Dangers	58
Lamana, Tandjung	137	Lights	58
Lamanggo, Kampung	50	Tidal streams	58
Lamarche, Hoek	218	Lemian, Labuan	206
Lamo, Pasir	64	Lempate, Tandjung	49
Lampau, Tandjung	109	Lenggis eilandje	46
Langgear, Kampung	175	Lenggiua	101
Langgur, Kampung	169	Lengwati eilandje	204
Langkissiel eiland	123	Lenna, Straat	233
Language	4	Lerua	140
		Lesluru, Kampung	195
		Lèti eiland	196
		Anchorage	196
		Lèti eilanden	196

	Page		Page
Letwurung, Kampung	200	Loktonal	130
Léwa, Kampung	201	Loku gebergte	108
Anchorage	201	Lola eilandje	187
Liang eiland	41	Lola, Kampung	188
Liang, Kampung	150	Loleba Besar eilandje	86
Libano, Kampung	83	Loleba Ketjil eilandje	86
Libobo, Tandjung	99	Loleo baai	72
Liboli, Tandjung	131	Loleo, Tandjung	72
Liek eilandje	171	Loleo lama, Bocht van	91
Liem	122	Loleodjaha eilanden	81
Liember	97	Loleojaha islands	81
Life-saving	14	Lolobata, Tandjung	90
Signals	14	Loloda	62
Lifofa, Kampung	66	Loloda baai	61
Lifumatola eiland	111	Anchorage	62
Anchorage	111	Loloda eilanden, Noord	60
Lifumatola, straat	111	Loloda eilanden, Zuid	61
Dangers	111	Loloda, Kampung	62
Ligua eilandje	75	Loloda, Sungei	62
Ligua, Tandjung	75	Lololi	162
Ligua ma déhè, Tandjung	62	Loloor, Sungei	182
Liku eilandje	108	Lompa, Batu	152
Liku, Kampung	109	Lompus baai	72
Likupang, Kampung	55	Lontor, Gat van	159
Likupang, Rede	55	Lontor, Kampung	158
Anchorage	56	Lorentz rivier	265, 267
Dangers	56	Loslos eiland	225
Lilai eiland	71	Louise rif	40
Lilinta, Baai van	123	Luang eilandje	198
Anchorage	123	Luari, Tandjung	87
Dangers	123	Luba	140
Lilinta, Kampoeng	124	Lubwaän	201
Limau, Kampung	87	Lucipara eilanden	157
Limo eilandje	111	Luga, Tandjung	85
Lintutu eiland	192	Luhu eilandje	133
Lipang eiland	41	Luhu, Kampung	144
Lipo, Kampung	108	Anchorage	144
Lirung, Rede	38	Lukulèlè, Kampung	196
Anchorage	38	Anchorage	196
Provisions	38	Luku Luku	87
Tidal stream	38	Lumara, Wai	131
Lirung, straat	37	Lumatta, Tandjoeng	252
Anchorage	38	Lumute gebergte	136
Dangers	38	Lusahiti eilandje	138
Lisabata, Kampung	137	Lusaolat eilandje	138
Lissa, Tandjung	49	Luisala	137
Litin	94	Lut, Tandjung	96
Lkamar	197	Lutu Lutu	87
Lle Glogos, Karang	100	Lutur eiland; Aru eilanden	178
Lle Heep, Karang	100	Lutur eiland, Ritabel, Rede	207
Lobang, Batoe	234	Luwo eiland	95
Lobang Dapoas	70	Lynedoch shoal	17, 210
Lobang Haja	134		
Lobang Haya	134		
Lobang Solé	134		
Lobi, Tandjung	169	Maar eilandjes	186
Lobi Lobi, Tandjung	75	Maardjindjin eiland	189
Lobo, Kampoeng	258	Maarjinjin eiland	189
Loego eiland	231	Maas eilandje	168
Anchorage	231	Maba, Kampung	94
Loem eilandje	256	Mabi, Kampoeng	234
Loematta, Tandjoeng	252	Mabo, Tandjoeng	224
Loh Loh eilandjes	217	Light	224
Loi, Wai	150	Maboer rivier	270
Loid, Baai van	77	McCluer golf	239
Loka, Telok	202	Climate	240
Loki, Kampung	144	N. shore	240
Loki, Rede	144	S. shore	241
Lokon, Tandjung	158	Tidal streams	240, 242

	Page		Page
Madais Besar eiland	254	Mangoli eiland	108
Madais Ketjil eiland	254	N. side	108
Madjet	103	anchorages	109
Madorang eilandje	143	S. side	109
Mafa, Tandjung	100	anchorages	110
Magdal reefs	226	tidal streams	110
Mahema, Tandjung	44	Mangoli, Straat	110
Mahengetang eiland	47	Danger	110
Mahoro eiland	48	Directions	110
Mahumu eiland	43	Tidal streams	110
Mai eiland; Lucipara eilanden	157	Maniai, Poeloe	247
Mai eiland; Schildpad eilanden	157	Manien eilandje	184
Maidi eilandje	101	Manil, Poeloe	222
Maidi, Kampung	66	Manipa eiland; Manipa, Straat	133
Anchorage	66	Anchorage	133
Maidi, Teluk	101	Light	133
Maikoor eiland	176	Manipa eiland; Sangi eilanden	41
Maikoor, Kampung	182	Manipa, Straat	133
Maikoor, Sungei	182	Tidal streams	133
Maikur eiland	176	Mano eiland	81
Maikur, Sungei	182	Manoeran eiland	218
Main Main, Takat	66	Mansfield eilanden	220
Maitara eiland	69	Mansoear eiland	220
Majalibit baai	221	Mansoear, Kampoeng	220
Majasalava, Tandjoeng	224	Manterawu eiland	53
Majet	103	Manuk, Eiland	157
Majoe rivier	270	Anchorage	157
Maju eiland	59	Manumbai, Kampung	181
Maka eilandje	67	Manumbai, Sungei	181
Makalehi eilandje	49	Directions	181
Makalehi, Kampung	49	E. approaches	186
Makariki, Kampung	146	anchorages	186
Makebon, Kampoeng	234	dangers	186
Makemaw rivier	264	W. approach	181
Makian eiland	69	Manusela gebergte	147
Makina, Tandjung	137	Manuwai, Kampung	200
Makmak eiland	233	Maoewan rivier	238
Makoi, Tandjoeng	225	Maoewara eiland	258
Mala, Vlakte van	128	Maopora eiland	192
Mala, Wai	128	Mapao, Napu	38
Mala Mala eiland	114	Mappi rivier	269
Malabuha, Tandjung	78	Mar eilandje	189
Malakafani, Tandjung	179	Marampit eiland	35
Malifut, Kampung	91	Marampit, Kampung	35
Malitehang, Batu	45	Marchesa baai	225
Malo eiland	35	Mare eiland	69
Malumdidim eilandje	184	Mare, Kampung	69
Mamang baai	72	Anchorage	69
Anchorage	72	Mare, Straat	69
Mambuat eiland	76	Maregarango, Tandjung	76, 81
Mamuja	88	Maribio eilandje	225
Mamuya	88	Marie	40
Manahan, Kampung	36	Marikapal eilanden	73
Manare, Tandjoeng	216	Marikapal, Tandjung	73
Manawoka eiland	162	Mariri eiland	187
Mandioli eiland	75	Mariri eilanden	187
Anchorage	75	Anchorage	187
Dangers	75	Mariri, Kampung	187
Mandobbe rivier	271	Marirremaar, Sungei	181
Mané Tep baai	217	Marlassi, Kampung	183
Manga, Tandjung	78	Marlassi, Sungei	183
Manganitu, Baai van	43	Marlau eilandje	160
Anchorage	43	Marore eiland	39
Danger	43	Marosa, Pulu	116
Mangga, Tandjung	75	Marsegu, Pulu	135
Manggur eiland	166	Maru eiland	201
Mangi Mangi eilandje	120	Maruing	143
Manginpulo	37	Mas, Kampoeng	251
Mangkawoe	259	Anchorage	251

	Page		Page
Masaran, Tandjung	77	Mendawong, Kali	77
Masarang, Pasir	73	Menlau eilandje	185
Masare eilandje	48	Mentai eilandje	185
Masareh, Tandjung	37	Mentjeri eilandje	109
Masawoi eilandje	133	Mentuhé, Sungei	43
Masela eiland	200	Meoh, Tandjung	50
Masidan, Kampung	183	Merah, Tandjung	58
Masio	48	Meranin rivier	237
Masiwang, Tandjung	142	Merauke, Rede	276
Masiwang, Wai	142	Anchorage	277
Masmas Oelit	121	Beacons	277
Mata	119	Buoyage	277
Mata Mata gebergte	90	Directions	277
Mataia, Tandjung	147	Lights	277
Matalel, Karang	97	Pilotage	277
Matan eilandje	227	Rainfall	27
Maté eiland	123	Tidal streams	277
Matkus eiland	206	Merauke rivier	278
Matot, Tandjung	166	Meriam, Tandjung	152
Matotjanat	166	Meriri, Baai van	36
Matutuang eiland	40	Meru eilandje	74
Mauwara eiland	258	Merukujuring, Tandjung	179
Mawea, Kampung	89	Meruru, Telok	146
Mbalu, Napu	39	Mes eilandje	209
Mé eiland	215	Mesa eilandje	98
Measures	5	Mesa, Kampung	97
Meaterialam eilandje	198	Mesa, Rede	98
Meatij Miarang eiland	198	Directions	98
Anchorage	198	Mesawai eilandje	225
Buoys	198	Mesemta eiland	122
Light	198	Metamani baai	239
Mede eilandje	89	Metamani rivier	238
Meer, Tandjung	141	Metanuan, Tandjung	204
Méfa	129	Meti Meti rif	249
Mega, Kampoen	234	Meti Rottan rif	207
Mega, Rede	334	Metonga raffen	93
Mega, Sungei	234	Metutun eilandje	198
Mehil eilandje	233	Mi, Karang	97
Mekohahe	41	Mia eilandje	95
Mela, Karang; Kokka, Baai van	98	Miarin eiland	213
Mela, Karang; Weda baai	97	Midden eilandje	129
Melihang	41	Middle sand	78
Meloku, Kampung	67	Middleburg eiland	235
Anchorage	67	Middlezand	78
Melwuar Niwejar	201	Mie, Karang	97
Memanuk eiland	40	Mijwawon rivier	270
Membok eilandje	231	Minien eiland	188
Light	231	Mimika rivier	264
Memjai eilandje	222	Minahasa district	2, 51
Menado, Baai van	50	Minangan, Baai van	49
Menado, Rede	51	Minangan, Kampung	49
Beacons	51	Mingari, Tandjoeng	244
Buoys	52	Mingiman eiland	219
Climate	51	Minjai Foen eiland	216
Climatic tables	34	Mios Arar	216
Directions	52	Mios Koean	213
Facilities	52	Mios Kon	220
Lights	51	Mios Mandoeing	214
Limits	52	Mios Ros	214
Radio	52	Mios Soe	235
Wharf	52	Miskin eilandje	70
Menado rivier	50	Misool eiland	120
Menado Tua eiland	53	E. side	122
Menalu, Baai van	45	anchorage	122
Anchorage	45	off-lying islands and dangers	122
Dangers	45	N. side	121
Mencheri eilandje	109	dangers	121
Mendaku eilandje	44	tidal streams	121

	Page		Page
Misool eiland— <i>cont.</i>		Morotai eiland— <i>cont.</i>	
S. side	123	N.W. side	82
anchorage	123	anchorage	83
tidal streams	124	Tidal streams	83
Mitak eiland	203	Morotai, Straat	85
Mitan eiland	191	Anchorage	85
Mitduan	173	Islets and dangers	86, 87
Miten	129	Moti eiland	69
Mitfeer	170	Motlol, Tandjoeng	123
Miti eiland	89	Mtu eilandje	98
Mitita eilandje	87	Muari eiland	72
Mitliler	170	Muha Nuhu Janet eilandje	170
Mitnaloa	173	Muiliijk eiland	99
Mitroa	172	Muor, Pulu	96
Mituwat	173	Murua, Tandjung	144
Miulu, Baai van	45	Muslenar, Tandjung	172
Miulu, Kampoeng	45	Muturi, Sungei	245
Moa eiland	197		
Moa, Straat	197	Naam, Kampung	171
Moanga, Kampung	197	Nagoera, Kampoeng	256
Modan, Poeloe	244, 247	Nagoera, Tandjoeng	256
Modan, Straat	247	Nai eiland	171
Modderhoek	270	Nailaka eilandje	158
Moe eilandje	229	Nain eiland	53
Moebke rivier	272	Nain Ketjil eiland	53
Moegem, Kampoeng	239	Naira eiland	158
Moeras rivier, Groot	266	Anchorage	159
Moeslat eilandje	121	Directions	159
Moet Mafela eilandje	121	Lights	159
Moetoeri, Kampoeng	245	Piers	159
Moetoeri, Sungei	245	Rainfall	27
Moetoes Besar eilandje	216	Nakaëla	136
Moetoes Ketjil eilandje	216	Nalahia, Baai van	155
Mof	100	Nalahia, Kampung	155
Moff eilandje	214	Nalbesi, Kampung	130
Mogogimbun eilandje	57	Nam, Kampung	166
Anchorage	57	Namaa, Tandjung	136
Moha, Kampung	184	Namalèn, Tandjung	162
Mokali, Tandjung	93	Namaripi, Tandjoeng	262, 263
Mokon eilandjes	225	Namasan, Kampoeng	256
Mokotamba, Tandjung	54	Namatimor, Tandjung	141
Molana eiland	153	Namatotte eiland	257
Molbufa, Kampung	112	Nambima, Tandjoeng	259
Molu eiland	201	Namlea, Rede	126
Molucos	2	Anchorage	126
Molukka sea	59	Beacons	126
Currents	18	Directions	126
Islands and dangers	59	Light	126
Tidal streams	59	Namelea, Vlake van	124
Weather	23-25	Namrole, Baai van	130
Molukken archipel	2	Anchorage	130
Molukken, Noordelijke	3	Danger	130
Molukken, Zuidelijke	3	Directions	130
Momfafa, Tandjoeng	221	Namrole, Kampung	130
Mommon	251	Namsar	165
Momow raffen	87	Namtabung, Kampung	206
Money shoal	17, 210	Namwaan eiland	202
Monggé, Kampoeng	240	Nanah eiland	228
Moëra	198	Nanoang, Straat	74
Anchorage	198	Nanusa eilanden	35
Morait	234	Anchorage	35
Morau eilandje	198	Current	36
Moré Porocho	62	Dangers	35
Moré Porotjo	62	Napoe = Reef, <i>see</i> proper name	
Morongé, Kampung	38	Napu = Reef, <i>see</i> proper name	
Morotai eiland	82	Nariki, Tandjoeng	262
E. and S. sides	84	Nassau gebergte	4, 263
anchorage	84		

	Page		Page
Nassau rif	66	Noehoe = Island, <i>see</i> proper name	
Natraal eilandje	205	Noejew, Tandjoeng	227
Natrool eilandje	205	Lights	228
Naurio Poeloe	265	Signal station	230
Anchorage	265	Noes Tiga eilandje	253
Nautilus, Straat	252	Noes Toemba	254
Approaches	252	Noesawammer eiland	247
Dangers	253	Noesawammer, Straat	247
Directions	253	Noesela eilanden	226
Tidal streams	253	Noesoe = Island, <i>see</i> proper name	
Ndoludeu, Tandjung	105	Noesoeroemi eilandje	258
Ndoluselagi, Tandjung	105	Nofanini eilandje	110
Negeri Baru, Kampung	132	Noiko, Pulu	172
Nenung eilandje	47	Nolot, Kampung	154
Nerong, Kampung	173	Nolot, Tandjung	154
Nerong, Straat	172	Nonaibal	172
Netherlands New Guinea	2	Nondang, Pasir	74
New Amsterdam fort	51	Noniali, Kampung	137
New Guinea	4, 212	Nonna, Batu	59
N. side	234	Nonoherana, Tandjung	135
Outlying banks	212	Noordkaap	50
S. side	273	Noordwest rivier	267
anchorage	275	Norolpitu	130
directions	275	North cape	50
S.W. side	252	Northumberland rif	39
tidal streams	252	Nu ka ha eiland	208
Weather	28	Nuhu = Island, <i>see</i> proper name	
W. side	236, 247	Nujanat eilandje	206
Newerip rivier	265	Nulen, Straat	204
Ngabordamlu, Tandjung	183	Nuniai eilandje	167
Ngaf eiland	170	Nus Leur eilandjes	193
Ngafan, Kampung	175	Nus Lima eilandjes	202
Ngai ma dodera eilandjes	73	Nus Taram eilandjes	204
Ngaibor, Kampung	182	Nus Tiga eilandje	253
Ngaibor, Sungei	182	Nus Tumba	254
Ngalipaeng, Baai van	46	Nusa, Pulu	37
Anchorage	46	Nusafnu eilandje	194
Ngalipaeng, Kampung	46	Nusanive, Tandjung	149
Ngèlè Ngèlè Besar eilandje	86	Light	150
Ngèlè Ngèlè Ketjil eilandje	86	Nusawammer	247
Ngidi Ma Chin	62	Nusreen eilandje	167
Ngidi Matjin	62	Nustabun eilandje	208
Ngidiun, Tandjung	168	Nusu = Island, <i>see</i> proper name	
Ngoab eilandje	185	Nusurumi eilandje	258
Ngoba eilandje	177	Nutfer eilandje	166
Ngofakiaha, Kampung	69	Nuwait eilandje	167
Anchorage	69	Nyaulaku, Kampung	92
Ngolin eilandje	204		
Ngolopopo, Tandjung	96		
Ngoni, Tandjung	182		
Nibé, Wai	125	Oba, Tandjung	64
Nieuw Krei, Kampung	189	Obaa rivier	270
Nieuw Victoria, Fort	150	Obahan, Tandjung	176
Nika eilandje	194	Obi eilanden	113
Nil Desperandum reef	195	Obi Latu eiland	114
Nila eiland	194	Anchorage	114
Nini eilandje	111	Obi Major eiland	113
Nip rif	87	N. coast	115
Nirun	29	anchorages	116
Nitu eiland; Karakitang eilanden	47	dangers	116
Nitu eilandje; Tanimbar eilanden	204	S. Coast	117
Niv	173	anchorage	117
Njadora, Tandjung	198	W. coast	114
Njamuk	182	anchorage	115
Njaolako	62	dangers	114
Njata eiland	190	Obi, Straat	80
Njaulaku, Kampung	92	Obit eiland	76
Anchorage	92	Obit group	76
Noe eiland	222	Obit, Tandjung	76

	Page		Page
Oceanic banks and shoals	16	Padian	39
Odammoen rivier	269	Padji, Tandjung	71
Oe rivier	269	Padosa eilandje	60
Oeaim, Tandjoeng	238	Pagama eilandje	111
Oehoeroepao	265	Pahepa eiland	48
Oeloepala, Tandjoeng	261	Paisumbaos, Tandjung	76
Oemar rivier	263	Pajahi, Baai van	65
Oemien eilandje	226	Pajahi, Kampung	66
Oempe eilandje	236	Paji, Tandjung	71
Light	236	Pajo, Kampung	64
Oenaginim eiland	232	Pako, Tandjung	45
Light	232	Palamea, Kampung	72
Oenoga eiland	253	Palele eiland	72
Oer Babo eilandjes	213	Pallo, Tandjung	39
Oera eilandje	221	Palpetu, Tandjung	124
Oerat eiland	250	Pamali	139
Oerobi eilandje	252	Pamali, Tandjung; Boano	135
Oesau, Tandjoeng	252	Pamali, Tandjung; Seleman baai	137
Oeta rivier	263	Pamariki, Kampung	133
Oetoemboewe rivier	267	Pananoaleng, Tandjung	45
Oewamba rivier	270	Pandara, Tandjung	109
Oewawa rivier	261	Pandita, Batu	56
Oewimmerah rivier	270	Pandjang eiland; Fak Fak	249
Ogar eiland	242	Light	249
Ohitoom, Kampung	167	Pandjang eiland; Gorong eilanden	162
Ohoideer, Kampung	168	Paniki, Pulu	117
Ohoideer Tutut, Kampung	172	Paniti, Kampung	96
Ohoiwait, Kampung	176	Anchorage	96
Oki eilandje	131	Pantai Wonrêli, Kampung	196
Oki, Rede	131	Pantai Wonrêli, Rede	195
Olat	137	Anchorage	195
Olendir, Labuan	206	Poa Besar eiland	72
Olifant	234	Pao Ketjil eiland	72
Olifant, Grootte	234	Paoni, Kampung	138
Olobie palé eilandje	124	Paoni, Rede	138
Ombar, Tandjoeng	263	Papenberg	158
Ombree eiland	229	Paperu, Tandjung	154
Ombwallar rivier	255	Papetu, Tandjung	36
Omnial, Kampung	103	Papis Doemandé, Kampoeng	276
Onat	93	Papisoi, Tandjoeng	202
Ondengbui	35	Papua	4
Ondur, Kampung	163	Papudu	90
Ondur, Rede	163	Para eiland	47
Anchorage	163	Parang eiland	142
Ongari, Kampoeng	276	Paraoka rivier	263
Onu	63	Parapotang eiland	76
Oostgat	158	Parigi, Tandjung	116
Oosthuk	78	Pasahari, Kampung	140
Oosttop	90	Pasegal	78
Openta, Tandjoeng	122	Pasi = Sand, sandbank, <i>see</i> proper name	
Opmarai, Tandjoeng	235	Pasi Ipah eilandje	107
Ora Sillam	272	Pasi Ipah, Kampung	107
Orafruan, Straat	208	Pasige eiland	49
Orang Kaja eiland	82	Pasir = Sand, sandbank, <i>see</i> proper name	
Oranje gebergte	263	Pasir Besar	86
Oratu, Tandjung	175	Pasir Putih, Kampung; Kau baai	91
Oremma rivier	261	Pasir Putih, Kampung; Obi Major	117
Ormsbee bank	212	Pasir Putih, Tandjung	126
Osir, Tandjoeng	241	Pasir Tidore, Karang	101
Oson	147	Passtwe rivier	269
Otakwa rivier	266	Patahog, Tandjung	112
Oud = Old, <i>see</i> proper name		Patani, Kampung	97
Ouw, Tandjung	154	Patani, Rede	97
		Pati, Kampung	197
Pachikara, Tandjung	90	Patiente, Straat	78
Padangi, Tandjung	83	Anchorages	79
		Dangers	78

	Page		Page
Raroang	77	Rumbati, Kampong	241
Ratemau, Tandjung	64	Run eiland	158
Recovery islet	95	Anchorage	158
Rede = Roadstead, <i>see</i> proper name		Rur, Tandjoeng	238
Ree eilandje	167	Ruta, Kampung	146
Reejanat eilandje	167		
Regulations	13	Sabatai gebergte	82
Rembang	166	Sabatai, Kampung	85
Remdi, Tandjung	97	Sabatang, Kampung	79
Reni eilandje	214	Sabatang, Rede	79
Repairs	5	Anchorage	79
Rerean eilandje	175	Sabir eilandje	186
Rewan eilandjes	184	Saboeda eiland	248
Riama eilandje	207	Light	248
Riboettoetin, Tandjoeng	248	Sabra, Tandjoeng	239
Rif = Reef, <i>see</i> proper name		Light	240
Rijklof van Goens baai	250	Safi, Tandjung	65
Riki, Tandjung	152	Saga, Nusa	74
Ritabel, Kampung	208	Sagea	97
Ritabel, Rede	207	Sagea, Kampung	98
Anchorage	207	Sagemoer eilandje	241
Approaches	207	Sagewin eiland	224
Beacons	207	Sagewin, Straat	224
Light	207	Anchorages	225
Rittowé rivier	244	Sagin eilandje	257
Rivier = River, <i>see</i> proper name		Sagof group	122
Roembati, Kampong	241	Sahang, Tandjung	43
Roemoninpori, Tandjoeng	238	Sahaong eilandje	54
Roer, Tandjoeng	238	Sahaong, Tandjung	54
Roeton eilandje	214	Sahendaruman	43
Rogi Rogi	78	Sahu	63
Romang eiland	191	Sahu baai	63
Anchorages	191	Anchorage	63
Romang group	190	Sahuai	143
Tidal streams	190	Said, Kampung	150
Rombombo eilanden	227	Sailal	93
Ronde rif	94	Saileen, Kampong	226
Rongi Mhé, Tandjung	62	Sailolof, Kampong	226
Roni eilandje	91	Anchorage	226
Rosenberg, Straat	167, 171	Safmba, Tandjoeng	261
Rostisge hoek	217	Sain	94
Rots = Rock, <i>see</i> proper name		Saine, Hoek	217
Rowa group, Nuhu	167	Sajafi eiland	95
E. and S. sides	171	Sajang eiland	212
anchorages	172	Sajuang, Kali	79
off-lying dangers	171	Saka	137
N. part	167	Saketa, Kampung	79
dangers	167	Anchorage	79
W. side	170	Sakita, Tandjung	112
directions	171	Sakomata, Tandjung	105
off-lying islands and dangers	170	Salahutu	149
Rozengain eiland	159	Salakiti baai	241
Rozengain, Kampung	160	Salakiti, Tandjoeng	239
Rozengain Rif van	160	Salakoela eiland	259
Ru, Nuhu	174	Salam Burung, Tandjung	116
Ruang eiland	49	Salangadékké eiland	60
Ruang Vulkaan	49	Salawati eiland	225
Ruba Ruba, Tandjung	61	Anchorage	226
Ruige huk	79	Directions	226
Ruku, Kampung	89	Sale, Sungei	63
Ruku, Sungei	89	Salebabu, Baai van	38
Rulofs eiland	252	Anchorages	39
Rumadan eiland	168	Danger	39
Rumah Lusi, Kampung	164	Salebabu eiland	38
Rumahkuda baai	191	Saleh Besar eiland	78
Rumahkuda, Kampung	191	Saleh Ketjil eiland	78
Rumakai, Kampung	145	Salche eilandje	41
Anchorage	145		

	Page		Page
Salengkere eiland	47	Sangowo, Kampung	86
Salia, Tandjung	131	Saniani, Tandjung	133
Salimar, Tandjung	42	Sansapor, Tandjoeng	235
Salimuli, Tandjung	85	Sansapor Baroe, Kampoeng	235
Salipogot eilandje	73	Santaré, Pulu	113
Salo, Pulu	64	Santigi eilandjes	178
Salotoen Genan eiland	226, 232	Saobas, Tandjoeng	218
Salotoen Pele eiland	226	Saoesoet, Kampoeng	234
Salomakie eiland	82	Saolat	91
Salonggaka, Tandjung	38	Saonek, Kampoeng	221
Salurang, Tandjung	46	Anchorage	221
Anchorage	46	Saonek Besar eiland	221
Saluta, Kampung	85	Saonek Ketjil eiland	221
Salwassa, Baai van	204	Saonek, Rede	221
Salwassa, Kampung	204	Sapa, Takat	118
Salwassa rivier	204	Saparua eiland	154
Sam Doemandé, Kampoeng	276	Anchorage	154
Sama eilandje	43	Rainfall	27
Samala, Tandjung	133	Saparua, Kampung	155
Samang, Tandjung	179	Saparua, Rede	154
Samaniak, Kampoeng	240	Beacon	155
Samate, Kampoeng	225	Light	155
Samate, Rede	227	Saparua, Straat	153
Anchorage	227	Anchorages	153
Approaches	227	Saplap eiland	226
Sambaki, Straat	73	Sapola, Tandjung	137
Directions	74	Sapolewa	138
N. approach	73	Saraa Besar eilandje	37
dangers	73	Saraa Ketjil eilandje	37
S. approach	73	Sarahungu	45
beacons	74	Sarawaki, Tandjung	75
dangers	74	Sari Batsia	208
Tidal streams	74	Sari Karmut	207
Sambiki, Pulu; Mangoli	109	Sari Karmuta	208
Off-lying dangers	110	Sari Kilmasa	208
Sambiki, Pulu; Obi eilanden	115	Sari Waturu	208
Samesan rivier	237	Sariga eilanden	242
Sametinke	275	Saripa baai	217
Saminjamau eilandje	83	Sarmana, Tandjung	128
Samlowos, Karang	97	Sarooë Noes eilandje	258
Samo	75	Saroma, Tandjung	132
Sampo, Tandjung	38	Saruë Nus eilandje	258
Sanafi, Kampung	102	Sasadu	144
Sanana, Baai van	112	Beacon	144
Anchorage	113	Saselata, Tandjung	66
Beacons	113	Saumlaki, Baai van	206
Sanana eiland	111	Saumlaki, Kampung	206
E. side	112	Saumlaki, Rede	206
W. side	111	Light	206
anchorages	112	Rainfall	27
dangers	112	Sawai, Baai van	138
Sanana, Kampung	113	Sawai eilandje	138
Sanane	128	Sawang, Kampung ; Sangi	42
Sanggala baai	251	Sawang, Kampung ; Siau	48
Anchorages	251	Sawara Sekai, Tandjoeng	259
Approaches	251	Sawasar, Tandjoeng	234
Dangers	251	Sayafi eiland	95
Sanggaluhang eiland	47	Schiereiland = Peninsula, <i>see</i> proper name	
Sangi eiland	42	Schildpad eilanden; Banda sea	157
E. side	44	Schildpad eilanden; Misool	226
anchorage	44	Schildpad eiland; Tanimbar	208
Islands and dangers N. and N.E.	41	Schoen eiland	217
N. side	42	Schoteroog eilandje	104
anchorage	42	Schraal eiland	99
Tidal streams	44	Schultz hoek	271
W. side	42	Sebakor baai	248, 250
Sangi eilanden	2, 41	Anchorage	251
Sanguangkiano, Kampung	76	Dangers	250
Sangoilin Mon straat	233		

	Page		Page
Sebjar rivier	240	Sereh, Baai van	38
Sedja eilandje	187	Seremoek rivier	238
Segarau eiland	232	Seri, Baai van	152
Light	232	Seri, Tandjung	152
Seget, Kampoeng	227	Seriwi gebergte	261
Segoen baai	237	Sermaaf, Tandjung	166
Segoen rivier	237	Sermata eiland	198
Seira eiland	204	Anchorage	199
Seitu, Tandjung	146	Sermata eilanden	4, 190
Sekar, Baai van	242	Current	190
Approaches	242	Weather	28
Dangers	242	Serodjil	214
Directions	242	Serotte, Poeloe	254
Sekar, Kampoeng	242	Serua, Eiland	195
Sekar, Tandjoeng	241	Anchorage	195
Seki, Tandjung	77	Seruawan, Kampung	145
Sel Pele, Kampoeng	215	Anchorage	145
Sel Pele, Tandjoeng	213	Serwaru, Kampung	196
Selagor	142	Anchorage	196
Selamo, Gat van	158	Serwatu, Sungei	182
Selaru eiland	206	Sesèpè, Kampung	116
Anchorage	206	Setan	149
Dangers	206	Seven islands	122
Directions	207	Sevivara, Ponta	190
Selatan eiland	157	Sewa rivier	275
Sele, Straat	226, 231	Sewa, Tandjoeng	277
Anchorage	233	Sfat eilandje	174
Beacons	232	Sial, Tandjung	136
Buoyage	232	Sialumaina	138
Dangers	232	Siam rivier	222
Directions	232	Siam, Tandjoeng	222
Lights	232	Sianiri Besar eiland	246
S. entrance and approach	231	Sianiri Ketjil eiland	246
anchorage	231	Siau eiland	47
beacon	231	Sibaboe, Tandjoeng	238
dangers	231	Sibela gebergte	76
directions	231	Sidanga eiland	61
light	231	Sidangoli, Kampung	64
Tidal streams	227	Sidangoli, Tandjung	64
Sele, Tandjoeng	212, 227	Sigaroi rivier	239
Seleboi, Tandjoeng	238	Sigemerai	244
Seleman baai	137	Signals	12
Anchorage	138	General communication	12
Seleman, Kampung	138	Life-saving	14
Seleman, Piek van	138	Light-vessels	12
Selepia, Tandjung	84	Pilotage	6
Seliha, Kampung	140	Searchlights	12
Selor, Kampung	147	Surveying vessels	12
Selu eiland	204	Siha eiland	47
Semai eiland	250	Sikata, Tandjung	39
Semar	93	Siko eiland	70
Semisarom eiland	258	Siladeng eiland	53
Semo, Kampung	67	Silahoro, Tandjung	65
Anchorage	67	Silajang eiland	118
Semo Semo, Tandjung	73	Silang baai	81
Semola, Tandjung	78	Anchorage	81
Sengga, Tandjung	72	Silang, Tandjung	81
Senindara, Sungei	246	Sille Djamka	237
Sensa, Baai van	45	Sille Sebak	237
Sensong, Baai van	45	Silo	60
Sentjan eilandje	248	Silota eilandje	100
Sepa, Kampung; Ceram	146	Silota, Tandjung	100
Sepa, Kampung; Weda baai	98	Simla rif	253
Seprang eilandjes	217	Simora, Kampoeng	257
Serang Laut eiland	161	Simora, Tandjoeng	254
Serang Rei eilandje	161	Sinapati	48
Serawantufa	140	Sindapa	79
Serbat, Tandjung	167	Sinopa	66
Sere ma doppio, Tandjung	79	Sipatnanam, Telok	248

	Page		Page
Sipsipa eilandje	217	Sulana eiland	61
Sirem	243	Sunam, Pulu	99
Sirih eilandje	135	Sungi, Kampung	175
Sirimau	149	Supai, Tandjung	73
Sisal, Tandjung	141	Supe, Kampung	136
Sisi, Kampong	257	Supu, Baai van	85
Sisi, Tandjung	144	Anchorage	85
Sisiandang rivier	257	Supu, Kampung	85
Sisir Watu, Sungei	179	Supur, Tandjung	197
Sitjek	172	Supurmela, Tandjung	196
Sjirnoesoe eiland	255	Surat	178
Skaro rif	157	Suriname baai	120
Snapan eilandje	224	Suru	148
Sneeuw gebergte	4, 263	Surveying vessels	12
Soa Sui, Kampung	69	Susulina	57
Soar	166	Susunu eiland	256
Sobrain eilandjes	233	Susupu, Kampung	63
Soearawara, Sungei	247	Suwal	149
Soesoene eiland	256	Suwuri gebergte	244
Soewoeri gebergte	244	Swingkrai, Kampong	220
Sofa Tandjung	96		
Tidal streams	96		
Sofianin, Kampung	208		
Sogiloga eiland	61		
Solat, Kampung	193	Taa, Nuhu	171
Solat, Telok	193	Taam eiland	167
Anchorage	193	Tabailengi eiland	84
Solat Len	241	Tabar eiland	185
Solat Kehli, Kampung	193	Tabertane, Kampung	182
Solè Kampung	133	Tabobi, Pulu	109
Sololo baai	94	Tabobo	90
Somorwahan, Tandjung	203	Tabor, Nusa	206
Songlijer, Tandjung	166	Tabrain	66
Sophia reef	117	Tabuji, Tandjung	116
Sopi, Kampung	83	Tabukan, Kampung	44
Sopi, Tandjung	82	Tabulu eilanden	108
Sopi, Teluk	82	Tadjam	93
Sori	81	Tadoku eilandje	82
Sorong Doom, Kampong	227	Tafelberg, Groot	215
Facilities	230	Tafelberg, Kleine	215
Sorong, Rede	227	Tafermaar, Sungei	183
Anchorage	230	Tagaja eiland	89
Approaches	227	Tagiri, Kampong	254
Beacons	229	Tagono, Kampung	71
Buoyage	227	Anchorage	71
Dangers	228	Tagono, Rede van	71
Directions	230	Anchorage	71
Lights	228	Tahafo, Kampung	63
Pilotage	228	Tahuku	154
Sorong, Tandjoeng	227	Tahulandang eiland	49
Light	228	Tahuna	42
Srewenoe eilandje	247	Tahuna, Rede	42
Standard and Summer times	5	Anchorage	42
Steenkool	245	Beacons	42
Steenkoolberg	244	Light	42
Steenkool-dorp	245	Tailutu	195
Stephanie eilandje	212	Tajam	93
Straat = Strait, <i>see</i> proper name		Tajandu eiland	166
Sua eiland	168	Tajandu eilanden	166
Suanggi eiland	157	Off-lying dangers	167
Suanggi eilandje	133	Taka, Takat = Shoal, reef, rock	
Light	133	<i>see</i> proper name	
Suarawara, Sungei	247	Talaud eilanden	2, 36
Subaim	90	Talengan, Baai van	45
Submarine cables	15	Anchorage	45
Sudara	57	Talengan, Kampung	45
Sukaradja, Kampung	137	Taliabu eiland	106
Sukeler eiland	204	Talirin	140
Sula eilanden	105	Talisei eiland	54

	Page		Page
Talisei, Rede	56	Tehang eiland	45
Anchorage	56	Tehoru, Rede	147
Buoys	56	Anchorage	147
Dangers	56	Telalora, Kampung	200
Light	56	Anchorage	200
Talitatu, Tandjung	138	Telawai, Tandjung	45
Taluti baai	146	Telegraaf rif; Ceram	137
Tamako, Kampung	43	Telegraaf raffen; Tajandu	167
Tamako, Rede	43	Telegraph	5
Anchorage	43	Telephone	5
Tamata	47	Tellang eiland	192
Tambelik eiland	73	Telok = Bay, <i>see</i> proper name	
Tameini eiland	65	Telor eilandje; Dowora	82
Tami	88	Telor eilandje; Obi Latu	114
Tamilau, Kampung	146	Telu, Nusa	149
Tamo Tamo	70	Teluk = Bay, <i>see</i> proper name	
Tamoelol, Baai van	122	Tema eiland	118
Tamoelol, Kampoeng	122	Teman eilandje	203
Tamperong eiland	55	Temeer Barat, Kampung	164
Tamrau gebergte	234	Temo ma dafa eiland	71
Tanah Merah settlement	270	Tendabalu, Tandjung	41
Tanak Merak, Tandjoeng	243	Tengah eiland; Kai eilanden	165
Light	244	Tengah eilandje; Tudjuh eilanden	137
Tandjoeng, Tandjung = Cape, point, <i>see</i> proper name		Tengah, Pulu	127
Tanduru Besar, Tandjung	135	Tengah, Pulu, Kampung	127
Taneti eiland	71	Tepa, Kampung	199
Tanimbar eilanden	4, 201	Tepa, Rede	199
Tanoesan Wimaro	246	Anchorage	199
Tantiri gebergte	244	Light	199
Tanu, Tandjung	91	Tepeleu, Kampung	96
Tapa eiland	82	Anchorage	96
Tapalol eilandje	123	Terbang eiland, Noord	193
Tapan, Tandjung; Buru	132	Terbang eiland, Zuid	193
Tapan, Tandjung; Piru baai	144	Teri	148
Tapat eiland	113	Ternate eiland	67
Tapatiti, Tandjung	65	Climate	68
Tapi, Tandjung	135	Rainfall	27
Tapiola eiland	118	Ternate, Rede	67
Tapusur eiland	178	Anchorage	68
Tarakan Ichi	88	Facilities	68
Tarakan Itji	88	Lights	68
Tarakan Lamo	88	Tidal streams	68
Tarakan eilandje	74	Terua, Tandjung	144
Taramnoesa, Tandjoeng	242	Terwissie	126
Tarella, Tandjoeng	260	Tête eiland	98
Taridoera rivier	246	Tetu	144
Taroare, Napo	40	Teun eiland	193
Tarof, Kampoeng	240	Tiabo rivier	88
Tarohan, Baai van	37	Tidal streams	17
Anchorage	37	Tidore eiland	68
Taronmeta, Tandjoeng	254	Anchorage	69
Tartaroega eilandje	248	Tidore, Kampung	69
Tatem	92	Tidore, Piek van	68
Taudore eiland	119	Tifonis, Kampung	93
Tauro lamo, Tandjung	64	Tifore eiland	60
Tawa, Kampung	116	Tifu baai	128
Tawabi, Kampung	82	Anchorage	128
Tawaigili	80	Tifu, Kampung	128
Tawali Besar eiland	72	Tiga eilandjes	178
Tawali Besar, Tandjung	73	Tiga, Poeloe	123
Tawali Ketjil, Pulu	73	Tihulale, Kampung	145
Tawang eilandje	65	Anchorage	145
Tawar, Telok	241	Tikus	206
Tawerei	244	Tikus eilandje	135
Tawun, Nuhu	168	Tilei, Kampung	86
Tef Dula	129	Timoeke rivier	265
Tegal rif	168	Timor eiland	190
Tegin, Tandjoeng	248	Timor, Portuguese	2

	Page		Page
Timor sea	209	Tokaka, Tandjung	67
Currents	209	Tokito	88
Depths	210	Tolimago eilandje	72
Isolated dangers	210	Tolimao eiland	70
Tina, Wai	130	Tolufu, Kampung	62
Tindila eilandje	54	Tomahu	125
Tioor eiland	163	Tomahu eilanden	127
Tipin, Kampoeng	225	Anchorage	127
Tipoeka rivier	265	Tomako ma fatu; N. Loloda	61
Tiro eilandje	62	eilanden	
Tjapali eilandje	83	Tomako ma fatu; Goraitji	70
Tjapalulu, Kampung	110	eilanden	
Tjapalulu, Straat	105	Tombona rivier	258
Anchorages	107, 108	Tombra, Kampung	196
Dangers	106	Anchorage	196
Directions	107	Tomo	139
Tidal streams	106	Tondano, Meer van	50
Tjauraga	62	Tongerai, Tandjoeng	250
Tjef eilandje	94	Tonggerap	234
Tjio, Kampung	83	Tonguin eiland	171
Tjoen eilandje	226	Tontonbulo	47
Tjukur	72	Tonu	133
Tjut, Nuhu	172	Tonuu eiland	88
E. side	175	Toplana	145
anchorages	175	Topor, Nusa	37
W. side	173	Toppershudje eiland	118
anchorages	173	Toppo rif	95
Toabi eilandje	70	Torano, Tandjung	154
Toabi Ketjil eilandje	70	Torawitan, Tandjung	54
Toade eilanden	41	Torpedoboot rivier	266
Toade Manandu, Tandjung	43	Tosu, Wai	135
Toardefete, Tandjung	180	Totaniwel	145
Toba eilandje	177	Toto, Tandjung	54
Tobalai eiland	117	Totoad, Kampung	170
Tobalai, Straat	117	Totone, Tandjung	43
Tobalien, Tandjung	91	Totu, Tandjung	152
Tobalo, Kampung	63	Towoa	39
Tobelo eilanden	88	Trade	5
Anchorages	89	Trangan eiland	176
Dangers	88	S.E. side	189
Tobelo, Kampung	89	beacons	189
Tobelo, Rede	89	dangers	189
Anchorages	90	directions	189
Beacons	89	Triton baai	258
Dangers	89	Anchorage	258
Toboko, Kampung	68	Triton bank	269
Beacon	68	Troubadour	16, 210
Todahé baai	63	Tsiof eiland	228
Todahé, Kampung	63	Light	228
Toduku eiland	73	Tuada eiland	73
Toduku, Tandjung	73	Tuakara eiland	60
Toebi Sérang eiland	249	Tual, Kampung	169
Toeboeroeasa eiland	250	Tual, Rede	168
Toeboekmatan, Tandjoeng	250	Beacon	169
Toemboe Toemboe eiland	252	Dangers	169
Toen eilandje	230	Directions	169
Toenas Gain, Kampoeng	250	Rainfall	27
Toerkangoer, Tandjoeng	250	Tuanane eilandje	83
Toewona, Sungei	243	Tuapen	72
Tofiri	64	Tuban eilandje	133
Tofiri, Baai van	64	Tubi Sérang eiland	249
Dangers	64	Tuburuasa eiland	250
Togarwatan, Telok	248	Tudjuh eilanden	137
Togohi	90	Tufa, Tandjung	141
Togoplun eilandje	95	Tufu ma lolè, Kampung	85
Tohosou, Tandjung	136	Tuhaha, Baai van	154
Toka, Tandjung	49	Anchorage	154
Tokabene, Tandjung	51	Tuli Kalio, Tandjung	102
Tokaka, Kampung	67	Tumber, Kampung	207

	Page		Page
Tumbu Tumbu eiland	252	Uwama, Tandjung	66
Tumpa	52	Uwana rivier	261
Tungor, Tandjung	167	Uwat Chain	78
Tunlean	148	Uwat Tjain	78
Tunowé, Tandjung	92	Uwawa rivier	261
Tuo Tuo	61		
Turi, Pasi	114		
Turkanggur, Tandjoeng	250		
Turtur Djuring eiland	188	Vaarwel eiland	99
Tusa eilandje	114	Vadsit, Tandjung	171
Tut Nei, Tandjung	197	Valsch = False, <i>see</i> proper name	
Tutu eilandjes	62	Valsch, Kaap	272
Tutualmatwai, Tandjung	145	Valwinden	173
Tutukai, Kampung	196	Vandoe eiland	229
Tutunaten, Tandjung	144	Var	171
Tutupano, Tandjung	179	Vat monal eilandje	207
Tutut, Nuhu	167	Vatilmas	171
Twee Gebruders	63	Vatsori	207
Two Brothers	63	Vatulmaa	207
		Vatvurat eilandje	203
		Veldman Klip	99
		Vera, Pulu	159
		Verbrande hoek	159
		Verloren eiland	99
Uafu Fendjuring, Tandjung	188	Vesuvius baai	107
Uafu, Fenjuring, Tandjung	188	Anchorage	108
Uaim, Tandjoeng	238	Viarre rivier	270
Ubu Ubu, Pulu	89	Vijf eilanden	81
Ubulié, Tandjung	102	Visschers banken	103
Ubur eiland	168	Visschers eiland	224
Udjir eiland	179	Vlakke hoek	263
Udjung Masaram, Straat	76	Vlakte = Plain, <i>see</i> proper name	
Uf, Telok	172	Vlaming eilandje	104
Whiteer eiland	170	Vogel eilandje	252
Uhiwa eiland	170	Voelsella shoal	17
Ular, Tandjung	180	Vorwahan, Tandjung	175
Light	180	Vriendschaps rivier	268
Ulfola, Kampung	110	Vroolijk	99
Uli, Tandjung; Ceram	137	Vuile hoek	74
Uli, Tandjung; Weda baai	99	Vulkaan = Volcano, <i>see</i> proper name	
Uliasers	149	Vulmali eilandje	203
Ulima, Kampung	132	Vuurberg	159
Ulu, Kampung	48		
Ulu, Rede	48		
Anchorage	48		
Light	48		
Ulupala, Tandjoeng	261		
Uluweru	159		
Umar rivier	263		
Umeputih, Tandjung	146	Wa Apu, Tandjung	126
Umera, Kampung	103	Wa Epalu baai	126
Unabensia, Kampung	108	Wa Leli gebergte	130
Undur, Kampung	148	Waa, Kampung	152
Undur, Tandjung	147	Waät, Tandjung	126
Ungar eilandje	203	Wadatutu, Tandjung	206
Unoga eiland	253	Waeken, Tandjung	127
Ur eiland	170	Waelila gebergte	140
Ur, Kampung	176	Waelolo, Tandjung	141
Ur, Rede	175	Wafani, Tandjoeng	123
Anchorage	175	Wafia, Tandjung	127
Uran eiland	164	Wagajel	121
Uranie eilandje	212	Wagoera	244
Urat eiland	250	Wagoera, Sungei	246
Urlin rif	142	Wagom	224
Urobi eilandje	252	Wahadan, Tandjung	176
Usau, Tandjoeng	252	Wahai, Baai Van	138
Ut eilandje	168	Anchorage	139
Uta eiland	103	Beacons	138
Anchorage	103	Dangers	138
Uta rivier	264	Directions	139
Utir eiland	170	Light	139
		Rainfall	27

	Page		Page
Wahai, Kampung	139	Wamlana, Tandjung	125
Wahalaulu eiland	184	Wamlonga eilandje	99
Wahru	171	Wamonet, Tandjoeng	236
Wai = Stream, creek, <i>see</i> proper name		Wamsasi, Kampung	128
Wai Lower, Kampung	117	Wamsisi, Kampung	131
Waifkalettet, Tandjoeng	231	Wanala, Kampung	130
Beacon	231	Wanatabur, Tandjung	165
Waigama, Kampung	121	Wandala, Tandjoeng	269
Anchorage	121	Wangeotak, Kampung	91
Dangers	121	Wania rivier	265
Directions	121	Wantebu, Tandjung	135
Tidal streams	121	Wap baai	251
Waigeo eiland	214	Anchorage	251
N. side	216	Wapoti, Tandjung	125
S. side	220	War Parear, Kampoeng	216
W. side	214	Anchorage	216
Waija, Kampung	146	War Samson	234
Wair, Kampung	173	Warhuk	172
Wair, Telok	173	Wari, Kampung	89
Wairole, Tandjung	149	Waria eilandje	185
Waisai baai	216	Waria, Kampung	185
Waisai, Kampoeng	216	Wariai, Tandjoeng	218
Anchorage	216	Warilau eiland	177
Waisamola, Tandjung	70	Waring eiland	73
Waisamu, Kampung	145	Waringin eilandje	81
Waisilé, Baai van	91	Waringin, Kampung	81
Anchorage	91	Warir eiland	233
Waisilip	215	Wariwi, Tandjoeng	260
Waisoi Besar, Tandjung	153	Warloi, Kampung	187
Waiwo, Kampoeng	226	Warna eilandje	171
Waiwoom, Kampoeng	216	Waromgé rivier	238
Waja	147	Warparim baai	216
Wajaban eiland	124	Anchorage	216
Wajabula, Kampung	83	Waru baai	141
Wajabula, Rede	83	Anchorage	141
Anchorages	84	Waru, Kampung	141
Wajabula, Tandjung	82	Warwawang, Kampung	198
Wajag eiland	212	Was eilandje	241
Wajam eilandje	222	Wasian rivier	245
Wajamli, Kampung	93	Wasian zee-arm	245
Wajamli, Tandjung	93	Beacons	245
Wajangan eiland	202	Buoyage	245
Wajatimu, Tandjung	78	Pilotage	245
Wajaua baai	81	Wasir eiland	179
Wajaua, Kampung	81	Wasir, Straat	179
Wajeteri eilandje	265	Wasop rivier	237
Wajio raffen	131	Wat Oko, Tandjung	70
Wajio, Tandjung	131	Watam gebergte	93
Wajteja, Tandjung	106, 108	Watam, Kampung	93
Waka, Tandjung	112	Watfera	167
Wakapara, Tandjung	110	Watida	92
Wakpapapi, Kampung	200	Watidal, Kampung	207
Wakré, Kampoeng	222	Watina, Tandjung	130
Walati, Kampoeng	274	Watinger eiland	118
Waleh gebergte	93	Watieu eilandje	167
Waleh, Tandjung	98	Watilewantutu, Tandjung	193
Walimen, Tandjung	128	Watlus, Tandjung	167
Walir eiland	167	Watmomal eilandje	207
Waloa, Kampung	132	Watmuri, Kampung	209
Walwawat, Tandjung	128	Watngit, Kampung	170
Wamal kreek	274	Watnus	175
Wamala, Tandjung	128	Wato Wato	90
Wamar, Pulu	179	Watu Keliang	162
Wamaroesa, Tandjoeng	249	Watu Lus	147
Light	249	Watubela eiland	163
Wambé, Tandjung	125	Watubela eilanden	163
Wambi, Kampoeng	275	Anchorages	164
Wambong	120	Tidal streams	164
		Watulai eiland	185

	Page		Page
Watulai eilanden	184	Woelan, Noesa	252
Watulai, Kampung	185	Woenoh eiland	217
Watuleijuring, Tandjung	177	Woenoh, Telok	217
Watuwai, Kampung	201	Woho	173
Anchorage	201	Woi	95
Wayabula, Rede	83	Woka eiland	81
Anchorage	84	Woka, Pulu	116
Wayabula, Tandjung	82	Woka, Tandjung	116
Wayamli, Tandjung	93	Wokam eiland	176
Wayaua, Kampung	81	Wokra	172
Wayio reefs	131	Wolas eilandje	204
Wayo, Kampoeng	276	Wolf rock	59, 71
Wayteya, Tandjung	108	Wolil eilandje	190
Weather	20	Wolo Genan eilandje	232
Weda baai	96	Light	232
N. side	97	Wolvat eiland	188
anchorage	97	Wonin eiland	166
dangers	97	Wonreli rivier	195
tidal streams	99	Woodford reefs	219
W. side	99	Wor eilandje	94
anchorage	99	Wori, Baai van	52
off-lying islands and dangers	99	Wori, Kampung	53
tidal streams	99	Workai eiland	188
Weda, Kampung	100	Workai, Sungei	181
Weda, Rede	100	N.E. approach	187
Beacons	100	anchorage	188
Dangers	100	Wot Oko, Tandjung	70
Weduar, Kampung	176	Wotai, Kampung	194
Weduar, Tandjung	172	Anchorage	194
Weduarfer, Kampung	173	Wotap eiland	204
Weeim eiland	226	Wotap, Straat	205
Weights	5	Directions	205
Weilon eilandje	96	Tidal streams	205
Welab, Kampoeng	274	Wotkuam, Tandjung	193
Wele	146	Woto eilandje	94
Wemoi, Sungei	246	Wroewarez eiland	224
Wenduar, Kampung	176	Wuarlawan	196
Anchorage	176	Wulan, Nusa	252
Weperar, Sungei	246	Wuliaru eiland	204
Wer Ur	175	Wulur, Kampung	193
Weri baai	250	Wuru Wuru	204
Weri Tambrian, Rivier	209	Wuwarlali	192
Werka, Kampung	174		
Wermatan eilandje	202		
Weroer, Kampoeng	235		
Werpigang, Kampoeng	249		
West eiland	242		
Wetan eiland	199	Yef eiland	100
Wetan, Straat	199	Yef Beto eilandje	119
Widi eilanden	99	Yef Doif eilanden	103
Wienta, Tandjung	45	Yiw eilandje	95
Wikromboes, Tandjoeng	259		
Wildeman rivier	269		
Wilhelmina Top	263		
Wilhelmus baai	193		
Anchorage	193	Zadelberg; Misool	122
Wiljam, Kampoeng	231	Zadelberg; Waigeo	218
Light	231	Zand eiland	99
Winchester bank	212	Zeearm = Estuary, <i>see</i> proper name	
Wingkong, Batu	45	Zeemeeuw reefs	226
Winsop, Tandjoeng	239	Zondalshoek	270
Wiriager rivier	240	Zonnegat	158
Wirjager rivier	240	Zoutberg	77
Wisalen, Kampung	162	Zuid = South, <i>see</i> proper name	
Witimdi	96	Zwaan baai	191
Wiwi	244	Anchorage	191
Woda eilanden	65	Zwarte Klippen	82
Woda, Pulu	65	Zwarte rotsen	213
Wodinhun eiland	184		

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